



JPRS Report

Science & Technology

USSR: Chemistry

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UDC 538.541.51

Magnetic Spin Effects During Photolysis With Polarized Light. Triplet Mechanism

18410178D Moscow ZHURNAL FIZICHESKOY
KHIMII in Russian Vol 43 No 3, Mar 89 (manuscript
received 10 Mar 88) pp 730-734

[Article by Yu. A. Serebrennikov, R. R. Mukhin, and B. F. Minayev, Karaganda State University]

[Abstract] The physical properties of the triplet state of organic molecules, excitons, and short-lived intermediate particles (biradicals, etc.) determine the flow of many photophysical and photochemical processes. Triplet collapse and selectivity of occupation as influenced by the anisotropy of spin-orbital interactions result in significant spin nonequilibrium in the system if the rate of spin-lattice relaxation is relatively low. Interaction of a non-equilibrium spin system with an external steady and (or) changing magnetic field affects the non-equilibrium polarization of electrons and nuclei and the relationship between the triplet lifetime (and therefore the quantum yield of the corresponding reaction) and the potential and frequency of the magnetic field. This mechanism of magnetic effects, named the triplet model, has been confirmed and is manifested in both organic and inorganic semiconductors and dielectrics and in photochemical reactions. In the present work the relationship between spin-selective occupation and collapse of the triplet state during photolysis with plane polarized light is discussed. The magnitude of the magnetic effect and the initial polarization of radicals formed by triplet excited molecules were calculated. These quantities and the lifetime of the triplet are shown to be functions of the angle between the electrical vector of the polarized light and the direction of the external magnetic field. Figure 1; references 13: 5 Russian, 8 Western.

UDC 532.783

Effect of Proton Irradiation on Electrical Conductivity of Cholesterol Liquid Crystals

18410178E Moscow ZHURNAL FIZICHESKOY
KHIMII in Russian Vol 43 No 3, Mar 89 (manuscript
received 24 Feb 88) pp 753-757

[Article by N. I. Gritsenko, N. V. Moshel, and V. V. Tsybulya, Chernigov State Pedagogical Institute imeni T. G. Shevchenko]

[Abstract] The need for more research on the effects of various types of radiation on the physical properties of liquid crystals has become acute with their ever widening field of practical applications. In the present work a study was made of the effects of proton radiation on the specific electrical conductivity, mobility, and charge carrier concentration in cholesterol liquid crystals. A general tendency for electrical conductivity to rise and phase transition temperature to fall with increasing radiation dosage was observed. Carrier concentration is

proportional to radiation dosage. Evidently, irradiation of cholesterol liquid crystals results in the generation of ionogenic radiation-induced impurities having a high degree of dissociation that differ markedly in nature from the more probable impurities, i.e. unreacted products of the initial synthesis. Figures 4; references 9 (Russian).

UDC 541.127.2.134.5:546.593.817.226

Contact-Chemical Reduction of Gold With Lead and Cadmium Sulfide Films

18410184B Leningrad ZHURNAL PRIKLADNOY
KHIMII in Russian Vol 62 No 3, Mar 89 (manuscript
received 5 Apr 88) pp 490-493

[Article by G. A. Kitayev, N. I. Dadchikova, and N. A. Suleymanova, Ural Polytechnic Institute]

[Abstract] Contact-chemical reduction of gold with metal sulfides is used to make metallic semiconductor electrodes and in leaching gold from solutions with sulfide sorbents. Although some questions on the sorption of gold with metal sulfides and certain technological aspects of fabricating electrodes by chemical means are described in the literature, the physical chemistry of these processes has not yet been studied. In the present work a study was made of the kinetics of the reduction of gold from auriohydrochloric acid solutions with semiconductor films of lead and cadmium sulfides. Thermodynamic calculations demonstrate the feasibility of the process. Formal kinetic equations describing the contact-chemical reduction of gold with lead and cadmium sulfide films were experimentally established. Figure 1; references 3: 2 Russian, 1 Western.

UDC 621.357.8.035:621.771.23

Determination of Optimum Design Parameters for Thin Ribbon Electrochemical Treatment Bath

18410184H Leningrad ZHURNAL PRIKLADNOY
KHIMII in Russian Vol 62 No 3, Mar 89 (manuscript
received 15 Jul 88) pp 718-721

[Article by T. A. Voronina, S. N. Sirotkin, and V. Yu. Zavarukhin]

[Abstract] A characteristic feature of electrochemical processes is the relationship of the speed at which they take place to the overvoltage. In electrochemical treatment of surfaces having nonuniform potential distribution, a nonuniform distribution of process speed is also observed at the electrode. This has a negative effect on both the quality and productivity of the electrochemical process. Nonuniform potential is therefore an important factor to take into account when conducting either anodic or cathodic processes. One of the basic reasons for unequal potential is the high ohmic resistance of the object being treated. Design problems of electrode shape and bath parameters to provide uniform distribution of

current density for a ribbon during electrochemical treatment were discussed in a previous work where it was assumed that the transverse dimensions of the ribbon are so small that the potential distribution within it may be considered uniform, and some average values for potential were obtained. In the present work these values are further refined by employing mathematical physics, and the potential distribution is calculated both on the surface of the ribbon and within it. Figure 1; references: 6 (Russian).

UDC 669.38;620.197

Behavior of Two-Phased Composite Materials Based on Copper in Water

184101841 Leningrad ZHURNAL PRIKLADNOY KHMII in Russian Vol 62 No 3, Mar 89 (manuscript received 26 Sep 87 pp 721-723)

[Article by V. G. Grechanyuk, A. V. Yamenko, and V. I. Topal]

[Abstract] Owing to their high thermal and electrical conductivities as well as their high resistance to corrosion,

composite systems based on copper are used widely as structural materials in instrument making, electronics, optics, and other areas. Since almost all new appliances and equipment operate at high temperatures and require some kind of cooling system, it becomes necessary to understand the behavior of these materials in coolant media. In the present work a study was made of the behavior of copper-molybdenum and copper-niobium carbide composites in water as coolant material. The composites were prepared by direct electron-beam vaporization and condensation of the vapor phase under vacuum. Corrosion in distilled and tap water was measured gravimetrically. The results show that the thermal resistance of the system depends on the stability of the component being added and the structure of the alloy. Addition of the more active molybdenum to a copper substrate lowers both the corrosion and thermal resistance of the system, while the chemical stability of niobium carbide raises the corrosion and thermal resistance of Cu-NbC. References 3 (Russian).

UDC 542.943.3+541.67

Catalytic Activity of Copper (II) Contained in KN-1 Fiber During Oxidation of Sodium Sulfide

18410178B Moscow ZHURNAL FIZICHESKOY
KHIMII in Russian Vol 43 No 3, Mar 89 (manuscript
received 30 Dec 87) pp 615-620

[Article by A. N. Astanina, Fom Man Tay, V. I. Volkov,
N. V. Kiryanova, and E. M. Trukhan, Moscow State
University imeni M. V. Lomonosov]

[Abstract] It has been demonstrated previously that iron- and copper-based ionite catalysts are active in the oxidation of sulfur compounds. The most active ionites include KB-4, which contains carboxyl groups capable of forming coordination bonds with transition metals. EPR-spectra showed that during sorption of Cu^{+2} ion with ionite KB-4, coordination complexes of copper (II) are formed in the polymer phase that contain carboxyl groups. In the present work EPR-spectroscopy was used to confirm the composition of copper (II) complexes in the polymer phase of chemosorption fiber VION KB-1, which contains carboxyl groups. A correlation was found between the microwave conductivity and the catalytic activity of copper (II) contained in the fibers during the oxidation of sodium sulfide with molecular oxygen. It was demonstrated that maximum microwave conductivity and maximum catalytic activity are related to the formation of binuclear copper (II) complexes in the fiber phase. Figures 4; references 10 (Russian).

UDC 539.193+539.27

Structure of Scandium, Vanadium, Chromium, Praseodymium, Gadolinium, and Holmium Trifluorides From Electronographic Data

18410178C Moscow ZHURNAL FIZICHESKOY
KHIMII in Russian Vol 43 No 3, Mar 89 (manuscript
received 25 Mar 88) pp 669-673

[Article by Ye. Z. Zasorin, A. A. Ivanov, L. I. Yermolayeva, and V. P. Spiridonov, Moscow State University imeni M. V. Lomonosov]

[Abstract] Despite recent studies on the properties of inorganic fluorides, structural data remain sparse, especially for the trifluorides of rare earth elements. In the present work electronography was employed to study the structures of two series of transition elements, viz., scandium, vanadium, and chromium (3d-elements), and praseodymium, gadolinium, and holmium (4f-elements). Force constants and geometric configurations were determined and vibrational frequencies calculated. References 29: 14 Russian, 15 Western.

UDC 541.124-13

Crystallization and Mass Transfer of Hydrogen in Compounds of System $\text{Li}_2\text{O}-\text{P}_2\text{O}_5-\text{WO}_3$

18410178H Moscow ZHURNAL FIZICHESKOY
KHIMII in Russian Vol 43 No 3, Mar 89 (manuscript
received 28 Jul 88) pp 810-812

[Article by A. A. Khodyakov, V. L. Bogdanov, V. V. Gromov, Ye. I. Saunin, and Ye. B. Fedorushkova, Leningrad Technological Institute imeni Lensovet]

[Abstract] Information on the role of mass transfer processes involving hydrogen ions in solid inorganic materials is very limited due to serious methodological problems and the multiplicity of factors affecting hydrogen mass transfer. Especially critical are estimates of hydrogen transfer parameters in the title system, where a number of such compositions have been observed to display the electrochromic effect. Some compositions of this system have a microheterogeneous structure caused by liquation processes. Whether or not a heterogeneous relationship or, more specifically, crystalline inclusions exist between the glass and mass transfer processes is still not clear. In the present work a study was made of the formation of crystal phases in the title system glasses. It was demonstrated that crystal phases thus formed do not limit hydrogen mass transfer. The effective coefficient of tritium bulk diffusion is related to the stability of the oxygen radicals and the total hydrogen content. Figure 1; references 1 (Russian).

UDC (542.8:543.24):546.571-31

Elevated Reactivity of Silver Oxide

18410184G Leningrad ZHURNAL PRIKLADNOY
KHIMII in Russian Vol 62 No 3, Mar 89 (manuscript
received 28 Dec 87) pp 692-694

[Article by D. E. Surpina, A. F. Seytzhano, T. I. Avdeyeva, B. F. Petrov, A. B. Fasman, and V. V. Naumenko-Zhivaya, Kazan Pedagogical Institute imeni Abaya; Organic Catalysis and Electrochemistry Institute, Alma-Ata]

[Abstract] Silver oxide is used in the electronics industry to make current-conducting metallized pastes by combining silver oxide powder with organic components. Some industrial lots of silver oxide have an elevated reactivity resulting in temperature rises in the mixtures and even explosions in some cases. The properties of silver oxide powder, as prepared by precipitation, depend on such conditions of synthesis as temperature, concentration of initial solutions, time, and order of mixing. It has been hypothesized that the elevated reactivity of the silver oxide is possibly due to impurities entering the silver oxide lattice. In the present work, derivatography, x-ray diffraction, x-ray photoelectron spectroscopy, particle size, and chemical analysis were used to study 10 different lots of silver oxide powders. The results demonstrate that there is no correlation between silver carbonate or metallic silver impurities content and silver oxide reactivity. The latter is apparently due to the presence of nonstoichiometric oxygen in the silver oxide. References 14: 5 Russian, 9 Western.

UDC 541.138

Effect of Benzotriazole and Its Derivatives on Electrode Processes on Copper in Sulfate Solutions

18410184C Leningrad ZHURNAL PRIKLADNOY KHMII in Russian Vol 62 No 3, Mar 89 (manuscript received 14 Sep 87) pp 531-535

[Article by N. I. Podobayev, E. I. Zhdanova, and E. G. Zak]

[Abstract] Benzotriazole is used widely to protect copper and its alloys in neutral electrolytes. Copper-benzotriazole films form in sulfate solutions with or without the presence of an oxide film, and it has been hypothesized that a Cu-O oxygen bridge forms between the film and the metal surface. A kinetic isotherm has been derived that describes formation of the film. Various derivatives of benzotriazole containing NO₂-, Br-, Cl-, CH₃-, and NH₂-groups in the 5- position of the benzene ring have been synthesized and demonstrated to have shielding effects on copper corrosion. In the present work, a continuation of this study revealed that among the aforementioned groups, the halogen derivatives are the most effective. Figure 1; references 14: 4 Russian, 9 Western.

UDC 621.357.7

Effect of Electrolysis Parameters and Anionic Electrolyte Composition on Mottling of Hafnium Coatings

18410184D Leningrad ZHURNAL PRIKLADNOY KHMII in Russian Vol 62 No 3, Mar 89 (manuscript received 1 Apr 88) pp 536-539

[Article by S. V. Kuznetsova, A. L. Glagolevskaya, S. A. Kuznetsov, A. T. Belyayevskiy, and A. I. Sorokin, Rare Elements and Minerals Chemistry and Technology Institute, Apatity]

[Abstract] Literature references on electroplating with hafnium are sparse. According to one source, hafnium may be deposited from a melt of lithium, sodium, and potassium chlorides containing 8 percent by weight hafnium tetrafluoride. While hafnium coatings have also been obtained by electrolysis from a pure sodium, potassium, and hafnium tetrafluoride melt on a molybdenum or tungsten-molybdenum cathode, information on the mottling of hafnium coatings is absent. In the present work a study was made of electroplating hafnium on a 1-mm-thick niobium substrate from a NaCl-KCl- K₂Hf₆ melt, with and without additions of 5 and 10 percent NaF. Coatings made with this melt are smoother than those obtained with sodium fluoride owing to micropassivation of crystal boundaries. Hafnium oxide acts as a passivating impurity and causes crystals to "break up". The addition of sodium fluoride to the melt dissolves the oxide films and depassivates the crystal boundaries, which in turn mottles the coating. Figure 1; references 8 (Russian).

UDC 543.8

Determination of Nitrate and Nitrite Ions in Natural Water With Griss Reagent

18410154F Kiev *KHIMIYA I TEKHOLOGIYA VODY in Russian Vol 11 No 2, Feb 89 (manuscript received 1 May 87) pp 120-122*

[Article by R. M. Lozan, V. M. Ropot, and M. A. Sandy, Chemistry Institute, Kishenev]

[Abstract] To determine their presence in aqueous solutions, nitrate ions are frequently reduced to nitrites with zinc or cadmium. Metallic cadmium, cadmium amalgam, or cadmium dust can be used with CuSO_4 , NH_4Cl , Na_2HPO_4 , or MnSO_4 as a catalyst. These methods are recommended for an analysis of food products. Zinc dust with ammonium chloride as a catalyst is more effective than cadmium. To determine nitrates in vegetable matter, a mixture of zinc dust and manganese sulfate is used, although the presence of strong oxidizing and reducing agents interferes with the determination so that lead acetate is first added to eliminate the sulfate ions. In the present work a study demonstrates that nitrate ions can be determined in natural water by reduction to nitrites with the Griss reagent. The sensitivity of the determination is 0.0155 mg of nitrogen per liter, and the error does not exceed 5 percent. Figures 2; references 5: 3 Russian, 2 Western.

UDC 628.162.5:628.347

Current Status of Regeneration Technology of Aluminum-Containing Coagulants From Hydroxide Slurry of Water Treatment

18410154G Kiev *KHIMIYA I TEKHOLOGIYA VODY in Russian Vol 11 No 2, Feb 89 (manuscript received 4 Jul 88) pp 123-137*

[Article by L. A. Kul'skiy, Yu. V. Yepifanov, and Ye. S. Matskevich, Colloidal Chemistry and Hydrochemistry Institute, Kiev]

[Abstract] A review on the technology of coagulant regeneration from hydroxide slurry resulting from water treatment covers acid, alkali, and other methods of regeneration, the use of regenerated aluminum-containing coagulants in water treatment technology, electrochemical processes to treat hydroxide slurries, and the future prospects for using coagulant regeneration in water treatment. Both positive and negative aspects of the methods are discussed. References 115: 71 Russian, 44 Western.

UDC 628.543.131

Pilot Plant for Mine Water Treatment by Electrocoagulation-Flotation

18410154H Kiev *KHIMIYA I TEKHOLOGIYA VODY in Russian Vol 11 No 2, Feb 89 (manuscript received 29 Sep 87) pp 147-151*

[Article by I. A. Zolotukhin, Environmental Protection and Coal Industry All-Union Scientific Research Institute, Perm]

[Abstract] Combined electrocoagulation-flotation treatment of mine water improves water quality with respect to such standards as suspended matter, oil products, surfactants, phenols, metal ions, and bacterial contamination. Large influxes of mine waters necessitated the development of high-capacity equipment not possible by simply enlarging the dimensions of known electroflotation designs. Current designs fail to satisfy all requirements, so in the present work a combined method was designed. It features soluble coagulation electrodes located in a separate vertical chamber adjacent to the flocculation chamber so as to enable greater utilization of the electrocoagulation effect through longer contact of the electrolysis products and gas bubbles with the treatment water. Untreated water is fed by gravity into the upper portion of the electrocoagulation unit, where it is thoroughly mixed with flotation reagent. The electrode unit is arranged to provide for rapid servicing by a mechanical device suspended from above or by air-blowing. A vertical flocculation chamber provides a longer path for bubble movement before emerging at the surface, thereby increasing the probability of flotation aggregate formation. A plastic bubble system located above the horizontal flotation chamber and within the foam accumulation section prevents the foam from being displaced into the clean water section, decreases dynamic loading at the foam layer, and diminishes the probability of breaking the foam layer down and recontamination of the water. The parameters of the unit are such that it may be used as a primary treatment for mine water in place of currently used thin-layer settling tanks or clarifiers. Figures 3; references 9 (Russian).

UDC 628.16.067

Coagulant Treatment of Water by Two-Stage Filtration

18410154I Kiev *KHIMIYA I TEKHOLOGIYA VODY in Russian Vol 11 No 2, Feb 89 (manuscript received 20 Jun 88) pp 151-155*

[Article by N. V. Yaroshevskaya, Ye. A. Shevchuk, and L. A. Kul'skiy, Colloidal Chemistry and Hydrochemistry Institute, Kiev]

[Abstract] Two-stage filtration is one of the leading methods for eliminating suspended and colloidal matter from water. The formation of deposits in the grainy filter bed resulting from impurity buildup is determined by

forces of adhesion and cohesion and is a function of their stability. Stability is normally lowered by treating the water with a coagulant. Impurity buildup during two-stage filtration depends on both the coagulant dosage and its distribution between the two stages of the filter. Empirical selection of rational conditions for water treatment with coagulants requires much difficult technological experimentation not suitable for a water treatment station subject to seasonal changes. In the present work contact coagulation curves were used to determine the coagulant dosage and its rational distribution between the two filter stages, and this resulted in a 1.2 to 1.4-fold greater longevity of protection. Figures 4; references 13 (Russian).

UDC 628.165

Effect of Complexons IOMS and PAF-13A on Formation of Calcium Sulfate Deposits During Vaporization of Mineralized Water

18410154J Kiev *KHIMIYA I TEKHOLOGIYA VODY in Russian Vol 11 No 2, Feb 89 (manuscript received 25 Jun 87) pp 155-157*

[Article by O. D. Linnikov and V. L. Podberyeyznyy, Chemical Machine Building SRI, Sverdlovsk]

[Abstract] Various complexons are now being used to prevent the formation of mineral salt deposits in water supply treatment plants. To help select an effective scale inhibitor, a study was made of the effects of the title complexons on the formation of calcium sulfate deposits during vaporization of mineralized water used to supply the primary unit in a desalination plant equipped with a 10-stage horizontal pipe evaporator. Complexon IOMS is a more effective scale inhibitor than is PAF-13A. When an aqueous solution of this complexon is heated, it decomposes and lowers the pH of the solution to promote the formation of magnesium hydroxide. Total inhibition of scale formation on the heat exchanger surfaces may be achieved with a complexon concentration exceeding 0.06 g/l. References 5 (Russian).

UDC 628.356(088.8)

Biochemical Treatment of Chromium-Containing Effluent

18410154L Kiev *KHIMIYA I TEKHOLOGIYA VODY in Russian Vol 11 No 2, Feb 89 (manuscript received 29 Sep 87) pp 169-172*

[Article by I. G. Roda and G. F. Smirnova, Colloidal Chemistry and Hydrochemistry Institute, Kiev]

[Abstract] One of the most dangerous sources of ground water contamination is effluent from electroplating plants containing significant quantities of chromium,

copper, zinc, cadmium, and other toxic metals. Additionally, the currently used facilities for treating these effluents do not always provide the required degree of heavy metal extraction. They are also costly and require reagents that are in short supply. For these reasons, efforts to increase the scale of research and development on the technology of biochemical treatment of heavy metal effluents have been accelerated in recent years. The feasibility and advantages of conducting anaerobic biochemical treatment of water to remove the above metals with sulfate-reducing bacteria has been demonstrated. However, the maximum values of heavy metal ion concentration, particularly chromium, do not exceed 100 mg per liter, which is too low for electroplating plants' conditions, where the concentration often exceeds 200-300 mg/l. Therefore, in the present work a study was made of the effects of high concentrations of chromium on the effectiveness of biochemical treatment of electroplating plant effluent when using sulfate-reducing bacteria. It was demonstrated that at relatively low initial concentrations of chromium (to 150 mg/l), the combined actions of adsorption and biogenic hydrogen sulfide result in total removal of the metal. The cumulative culture of sulfate-reducing bacteria was shown to be highly efficient in the removal of a broad spectrum of heavy metals from electroplating effluent. Figures 3; references 5 (Russian).

UDC 628.162.5:661.183.1+661.47+661.857

Using Ion Exchange Resins of Disinfection of Water

18410154M Kiev *KHIMIYA I TEKHOLOGIYA VODY in Russian Vol 11 No 2, Feb 89 (manuscript received 14 Jun 87) pp 181-182*

[Article by N. V. Aksenenko, L. F. Kiryanova, A. V. Maslyukov, G. A. Matyushin, G. A. Rakitskaya, G. K. Saldadze, and D. P. Solntseva, Medical Polymer SRI (A-U), Moscow]

[Abstract] Despite the considerable number of methods that exist for disinfecting water and the broad selection of disinfectants, the problem of disinfecting water for drinking purposes under dynamic conditions has not yet been solved. The complexity of the problem is centered on the extremely short duration of the period for which the disinfectant is in contact with the microorganisms (it does not to exceed several seconds) and the necessity for providing high reliability in disinfection of water having an initial *E. coli* bacterial count of 10^4 - 10^7 cells per liter. The present work examines the possibility of utilizing ion exchange resins to disinfect water for drinking purposes under dynamic conditions. It is demonstrated that river water could be disinfected from bacteria of the *E. coli* group after 2-5 seconds of contact with polyhalogen strong-base anion exchange resin and macroporous strong-acid sulfocationite in silver form. References 3 (Russian).

UDC 541.11

Thermodynamic Properties of Solid Solutions in System $\text{Bi}_2\text{O}_3\text{-Y}_2\text{O}_3$

18410178A Moscow ZHURNAL FIZICHESKOY
KHIMII in Russian Vol 43 No 3, Mar 89 (manuscript
received 22 Mar 88) pp 611-613

[Article by Yu. M. Berezovskaya, I. A. Vasilyeva, and A. F. Mayorova, Moscow State University imeni M. V. Lomonosov]

[Abstract] Interest in the properties of boundary-centric cubic solid solutions of the title systems is centered on the remarkably high oxygen conductivity of these substances at moderate temperatures (below 1,000 K) and on the possibility of using them as low-temperature oxygen electrolytes. In order to solve phase stability problems, information is needed on their thermodynamic properties. In the present work an EMF study was made of the thermodynamic properties of the title system in the homogeneous solid solution region. The resulting data were used to determine the homogeneity boundary of boundary-centric cubic solutions, and values for free energy of mixing were calculated. References 7: 2 Russian, 5 Western.

UDC 539.104

Radiation Effects and Hydrogen Mass Transfer in Lithium-Tungsten Phosphate Glasses

18410178G Moscow ZHURNAL FIZICHESKOY
KHIMII in Russian Vol 43 No 3, Mar 89 (manuscript
received 28 Mar 88) pp 808-810

[Article by A. A. Khodyakov, V. L. Bogdanov, V. V. Gromov, Ye. I. Saunin, and Ye. B. Fedorushkova, Leningrad Technological Institute imeni Lensovet]

[Abstract] If water were present in glass, it could participate in ion transfer processes. One possible way to study this phenomenon is to determine the diffusion parameters of tritium, a hydrogen isotope. To this end electrochromic lithium-tungsten phosphate glasses were selected. However, it is first necessary to clarify the degree of participation of various charge carriers in the ion transfer. Formation of tritium in glasses is a result of nuclear reactions on Li^6 and Li^7 during reactor irradiation at an integral neutron beam density not exceeding 10^{16} cm^{-2} . In the present work electron paramagnetic resonance was employed to determine the radiation paramagnetic sites arising as a result of the irradiation of lithium-tungsten phosphate glasses. Tritium mass transfer was measured radiometrically during thermal extraction. It was confirmed that the radiation paramagnetic sites do not limit hydrogen mass transfer and that hydrogen diffusion takes place by way of a heterodiffusion mechanism. Figure 1; references 3 (Russian).

UDC 537.52.541.43.123

Afterglow of Condensed Discharge in Nitrogen and Nitrogen-Hydrogen Mixtures

18410178I Moscow ZHURNAL FIZICHESKOY
KHIMII in Russian Vol 43 No 3, Mar 89 (manuscript
received 29 Feb 88) pp 819-822

[Article by O. M. Knipovich, Ye. A. Rubtsova, and L. I. Nekrasov, Moscow State University imeni M. V. Lomonosov]

[Abstract] A study of the bulk recombination of nitrogen atoms at concentrations of $4 \cdot 10^{15}$ to $3 \cdot 10^{16} \text{ cm}^{-3}$ in the afterglow of a condensed discharge revealed that metastable electron- and vibration-excited nitrogen molecules play a significant role. In the present work a study of the condensed discharge afterglow in pure nitrogen and in nitrogen-hydrogen mixtures shows that the addition of hydrogen has a significant effect on emission in the 582-nm range. The addition of 11-12 percent hydrogen causes a 2- to 6-fold drop in emission, while 20-25 percent hydrogen completely terminates emission. This is due to the interaction of ammonia and other nitrogen-hydrogen reaction products with nitrogen afterglow precursors, i.e., excited nitrogen molecules, which results in deactivation and extinction of emission. Figures 2; references 10: 3 Russian, 7 Western.

UDC 669.296:666.762.52.047

Synthesis of ZrO_2 -Based Solid Solution Powders by Coprecipitation of Components

18410184E Leningrad ZHURNAL PRIKLADNOY
KHIMII in Russian Vol 62 No 3, Mar 89 (manuscript
received 16 Feb 87) pp 548-552

[Article by S. Yu. Pliner, Yu. M. Polezhayev, Yu. I. Komolikov, S. B. Ushakova, and V. G. Peychev, Metallurgical Thermotechnical and Refractory SRI (AU)]

[Abstract] During the past several decades there has been an intensive effort to develop high-strength ceramics from tetragonal solid solutions based on zirconium dioxide for use in fabricating adiabatic internal combustion engines, machine tools, high-temperature bearings, and other purposes. Solid-solution powders measuring less than $0.5 \mu\text{m}$ are needed to produce this type of ceramic. It has previously been demonstrated that submicronic powders of solid solutions of Y_2O_3 in ZrO_2 could be prepared by ammoniacal coprecipitation of the components as hydroxides from aqueous solutions. In the present work this technique was used with multicomponent solid solutions in the system $\text{ZrO}_2\text{-Y}_2\text{O}_3\text{-CaO-MgO}$. This system has been preferred for making structural ceramics. The results indicate that the method can be recommended for preparing submicronic powders of zirconium dioxide solid solutions suitable for producing high-strength ceramics. Figures 4; references 8: 4 Russian, 4 Western.

UDC 541.1:548.3

Electron Conductivity of $\text{HSbO}_3 \cdot n\text{H}_2\text{O}$

18410214b Moscow *ZHURNAL FIZICHESKOY KHIMII in Russian* Vol 63 No 4, Apr 89 (manuscript received 30 May 88) pp 1077-1078

[Article by A. M. Matiyasevich and T. A. Karaseva, Institute of General and Inorganic Chemistry, UkSSR Academy of Sciences, Kiev]

[Abstract] The electroconductivity of electrolytes represents the sum of their ionic and electronic components; in the case of aqueous solutions, the electronic component could be disregarded; in contrast, solid electrolytes exhibit extensive electron conductivity. The electron conductivity of hydrated antimony pentoxide, a solid proton-conducting electrolyte, was studied. It was established that electron conductivity represents less than 0.01 percent of the proton conductivity of a given solid electrolyte and seems to be insignificant. It could be concluded that a solid proton-conducting electrolyte based on polyantimonic acid exhibits ionic conductivity and can be used in electrochemical equipment. Figures 2; references 5: 2 Russian, 3 Western.

UDC 539.186.3:546.26-162

Potential of Atomic Interaction in Diamonds

18410214e Moscow *ZHURNAL FIZICHESKOY KHIMII in Russian* Vol 63 No 4, Apr 89 (manuscript received 4 Jun 88) pp 1106-1107

[Article by M. N. Magomedov, Institute of Geothermal Problems, Dagestan Branch of USSR Academy of Sciences, Makhachkala]

[Abstract] Reaction potential of the gradual type is widely used in studies of diamond composition. To determine this function uniquely, all four potential parameters r_0 , D , b , and a must be determined. To do so, the "closest neighbor" interaction is approximated. In present paper, the parameters of paired interatomic potentials for diamond were determined. It was shown that these parameters yielded excellent agreement between the calculated and experimental data. References: 11 (Russian).

UDC 541.183

Structural Investigation of Chromoxide Layer Synthesized on Surface of Pyrogenic Silicon by Molecular Layering Method

18410214f Moscow *ZHURNAL FIZICHESKOY KHIMII in Russian* Vol 63 No 4, Apr 89 (manuscript received 1 Feb 88) pp 1109-1112

[Article by A. V. Isarov, G. A. Konishevskaya, Yu. V. Plyuto, and A. A. Chuyko, Institute of Surface Chemistry, UkSSR Academy of Sciences, Kiev]

[Abstract] Molecular layering is a promising method of synthesizing chromium (VI)-containing silicons; it is based on the repeated treatment of a SiO_2 surface with chromium oxychloride and water vapors. The goal of this work was to explain the way in which the degree of association of the oxoanions CrO_4^{2-} changes on the surface of pyrogenic silicon during such multiple treatment of the sample as modification with CrO_2Cl_2 vapors, hydrolysis with water vapor, and vacuum dehydration. On the basis of an analysis of electron spectra from the diffusion imaging of these modified silicon and crystalline isopolychromates it was concluded that an increased number of the aforementioned treatment cycles leads to larger-sized chromoxide clusters. Figures 2; references 11: 7 Russian (1 by Western authors), 4 Western (1 by Russian authors).

UDC 669.794

Formation Enthalpies of Intermetallic Compounds $\text{Fe}_{0.75}\text{Y}_{0.25}$, $\text{Co}_{0.75}\text{Y}_{0.25}$, $\text{Ni}_{0.5}\text{Y}_{0.5}$, and $\text{Cu}_{0.5}\text{Y}_{0.5}$

18410214G Moscow *ZHURNAL FIZICHESKOY KHIMII in Russian* Vol 63 No 4, Apr 89 (manuscript received 26 Jun 88) pp 1123-1124

[Article by O. Yu. Sidorov, M. G. Valishev, A. F. Yermakov, Yu. O. Yesin, and P. V. Geld, Ural Polytechnical Institute imeni S. M. Kirov, Sverdlovsk]

[Abstract] Enthalpies of the formation of yttrium intermetallic compounds ($\text{Fe}_{0.75}\text{Y}_{0.25}$, $\text{Co}_{0.75}\text{Y}_{0.25}$, $\text{Ni}_{0.5}\text{Y}_{0.5}$, and $\text{Cu}_{0.5}\text{Y}_{0.5}$) were determined at 298 K by using high-temperature mixing calorimetry. The experimental results were compared with data calculated by the Miedema model and showed general quantitative agreement for all intermetallic compounds except $\text{Fe}_{0.75}\text{Y}_{0.25}$. References 11: 7 Russian, 4 Western.

UDC 536.7

Thermodynamic Properties of Yttrium and Ytterbium Cuprates

18410214H Moscow *ZHURNAL FIZICHESKOY KHIMII in Russian* Vol 63 No 4, Apr 89 (manuscript received 2 Aug 88) pp 1132-1133

[Article by Yu. Ya. Skolis and S. V. Kitsenko, Department of Chemistry, Moscow State University imeni M. V. Lomonosov]

[Abstract] Results were reported of the direct experimental determination of the thermodynamic functions of the formation of yttrium and ytterbium cuprates from simple oxides by using the EMF method with a solid fluorine ionic electrode and different types of electrochemical cells. It was shown that, in the system Yb_2O_3 - BaO - CuO as well as in the Y_2O_3 - BaO - CuO system, the $\text{Yb}_2\text{Cu}_2\text{O}_5$ exists in equilibrium with $\text{Yb}_2\text{BaCuO}_5$ and Yb_2O_3 or with $\text{Yb}_2\text{BaCuO}_5$ and CuO . Data obtained by

the two methods were within the range of experimental error. References 6: 2 Russian, 4 Western (3 by Russian authors).

UDC 537.312.62

Kinetics of Reaction of Superconducting Ceramic $\text{YBa}_2\text{Cu}_3\text{O}_x$ With Oxygen

18410223B Minsk IZVESTIYA AKADEMII NAUK
BELORUSSKOY SSR: SERIYA KHIMICHESKIKH
NAUK in Russian No 2, Mar-Apr 89 (Manuscript
received 9 Sep 88) pp 27-32

[Article by V. V. Vashuk, O. N. Golovchan, I. F. Kononyuk, L. V. Makhnach, and T. N. Shalayeva, Institute of General and Inorganic Chemistry, Belorussian Academy of Sciences]

[Abstract] There are no systematic data in the literature on the kinetics of the interaction of $\text{YBa}_2\text{Cu}_3\text{O}_x$ with the oxygen in the surrounding gas medium as a function of temperature, partial oxygen pressure over the specimen, and direction of change in the partial oxygen pressure. This article presents a thermogravimetric study with simultaneous measurement of conductivity to determine the influence of these parameters on the rate of achievement of a given oxygen content by the ceramic. The data indicate an asymmetrical change in oxygen content in the specimens upon sudden transition from the area of high partial oxygen pressures to the area of lower pressures and back. Studies over 300-900°C with oxygen partial pressures of 1 to 10^5 Pa confirm the close interrelationship between the oxygen content and the temperature of transition to the superconducting state, conductivity, and the structure of the ceramic. The results also indicate that the absorption kinetics of oxygen and its liberation into the surrounding atmosphere are not symmetrical at identical temperatures and oxygen concentration gradient moduli. Figures 3; References 8: 2 Russian, 6 Western.

UDC 661.183.6+546.824.31

Synthesis and Properties of Titanium-Containing Zeolites With Ferrierite Structure

18410223D Minsk IZVESTIYA AKADEMII NAUK
BELORUSSKOY SSR: SERIYA KHIMICHESKIKH
NAUK in Russian No 2 Mar-Apr 89 (Manuscript
received 16 Nov 87) pp 40-43

[Article by A. V. Pismennaya and L. N. Malashevich, Institute of General and Inorganic Chemistry, Belorussian Academy of Sciences]

[Abstract] Specimens of titanium-containing zeolite with a ferrierite structure are synthesized, and their adsorption and catalytic properties are studied in the reaction of the synthesis of hydrocarbons from methanol. The zeolites are crystallized in an autoclave at 115°C from gels, washed in water, and heated to 550°C for 14 hours to remove organics. The data obtained indicate that the

adsorption and molecular sieve properties are influenced by the degree of crystallinity of the specimens, which depends on the quantity of TiO_2 introduced (the TiO_2 acts as a modifying agent of the catalytic properties). The process of the crystallization of the specimens is hindered by the increased content of titanium dioxide in the reaction mixtures. Introducing titanium dioxide increases the selectivity for pentenes and aliphatic C_6 hydrocarbons. Figures 2; References 8: 4 Russian, 4 Western.

UDC 665.765-404.038:66.012-52

Automation of Lubricant Material Production Processes

18410222E Moscow KHIMIYA I TEKHOLOGIYA
TOPLIV I MASEL in Russian No 4, Apr 89 p 14-15

[Article by A. M. Manoylo, All-Union Scientific Research, Production, and Design Institute of Petrochemistry]

[Abstract] As the production of lubricant materials is automated, the parameter most frequently used to judge production quality is the viscosity of the product. Processes are listed for which regression equations have been written that can be used to determine the degree of conversion based on the viscosity of the product. Viscosity can be automatically measured by series-produced low-frequency vibration viscosimeters. When viscosity is used as the basic control parameter, there is no need to develop devices to measure the degree of conversion of the initial products in the stream. References 8: Russian.

UDC 666.117.3

Thermal Expansion of Borosilicate Glasses as Function of Structure

18410223G Minsk IZVESTIYA AKADEMII NAUK
BELORUSSKOY SSR: SERIYA KHIMICHESKIKH
NAUK in Russian No 2, Mar-Apr 89 (Manuscript
received 23 Mar 87) pp 85-88

[Article by N. N. Yermolenko, S. G. Kotov, Belorussian Polytechnical Institute]

[Abstract] Assuming that all elements are involved in the formation of the structural framework of glass, the authors have previously developed a method of calculating the temperature coefficient of the linear expansion of silicate glasses. This article develops a method for considering the influence of the 3-dimensional structure of the structural fragments on the coefficient of expansion by introducing a coefficient for that purpose. The results indicate that the temperature coefficient of the linear expansion of SiO_2 - B_2O_3 glasses is not a linear function of the number and structure of the structural polyhedra making up the structural framework. The boundary between areas of linear variation of the coefficient corresponds to glass

in which the number of bonds made by silicon atoms in constructing the structural network of the glass is equal to the number of bonds made by boron atoms. The coefficient of expansion varies linearly with E_g as

determined by equation (4) presented in this article, which is recommended for the calculation of the coefficient in alkaline silicate and borosilicate glasses. Figure 1; References 7: Russian.

UDC 547.241

Reactions of Diorganyl Iodophosphines With Cyclic Ethers

18410218A Leningrad ZHURNAL OBSHCHEY
KHIMII in Russian Vol 58 No 12, Dec 88 (Manuscript
received 8 Jul 87) pp 2652-2660

[Article by N. D. Gomelya, and N. G. Feshchenko,
Institute of Organic Chemistry, Ukrainian Academy of
Sciences, Kiev]

[Abstract] A study is made of the reactions of the diorganyl iodophosphines, most of which may exist in both monomer and dimer forms. They react with trimethylene and ethylene oxides in the monomer form, reducing ethylene oxide to ethylene and being converted to diorganyl phosphinic acid iodides. They react with trimethylene oxide. This opens the ring, forming gamma-iodopropyl diorganylphosphinites first and then diorganyl-gamma-iodopropylphosphinoxides. They react with tetrahydrofuran as dimers and are converted to tetramethylene diorganyl phosphonium iodides, tetraorganyl pyrophosphinates, and 1,4-diiodobutane or di-tert-butylphosphinic acid iodide. They do not react with tetrahydropyran in a dry inert atmosphere. References 21: 14 Russian, 7 Western.

UDC 547.241

O- and P-Silylation of Lithium Acylphosphine Salts. E- and Z-Isomers of O-Silyl-Substituted Alkylisobutyrylphosphines and Their Regrouping as Vinylphosphines

18410218B Leningrad ZHURNAL OBSHCHEY
KHIMII in Russian Vol 58 No 12, Dec 88 (Manuscript
received 19 Jun 87) pp 2665-79

[Article by V. L. Foss, Yu. A. Veyts, Ye. G. Neganova, A. A. Borisenko, and I. F. Lutsenko, Moscow State University imeni M. V. Lomonosov]

[Abstract] Chlorosilanes react with the lithium salts of alkylisobutyrylphosphines in nonsolvating solvents at the phosphorus atom to form P-silylated acylphosphines in strongly solvating solvents at the oxygen atom of the salt to form Z-isomers of O-silyl-substituted acylphosphines. P-Silylated acylphosphines undergo intramolecular regrouping to form O-silylated E-isomers. Equilibrium between the E- and Z-isomers can be achieved from either end. Equilibrium is reached more quickly when halogensilanes are present and is inhibited by acylphosphine lithium salts. Phosphaalkenes are converted to vinylphosphines by migration of a hydrogen atom in the bond system from $P=C-CH$ to $HP-C=C$. Regrouping is facilitated when nucleophilic and, particularly, electrophilic catalysts are present. References 26: 11 Russian, 15 Western.

UDC 547.258.81+546.268.2

Reaction of bis(ϵ^5 -Cyclopentadienyl)Vanadium With Phenylisocyanate

18410218C Leningrad ZHURNAL OBSHCHEY
KHIMII in Russian Vol 58 No 12, Dec 88 (Manuscript
received 25 Jun 87) pp 2679-2683

[Article by A. S. Gordetsov, S. V. Zimina, V. K. Cherkasov, S. Ye. Skobeleva, V. L. Tsvetkova, T. I. Chulkova, and Yu. I. Dergunov, Gorkiy Medical Institute imeni S. M. Kirov]

[Abstract] A study was made of certain stages and products of the reaction of bis(ϵ^5 -cyclopentadienyl)vanadium by means of EPR and IR spectroscopy. Cp_2V was reacted with PhNCO in a sealed ampule in a medium of toluene or benzene. It was found that vanadocene reacts with phenylisocyanate by breaking the valence bonds of the heterocumulene fragment of the phenylisocyanate, yielding a number of intermediate paramagnetic complexes that are converted with time to more stable bis- (Cp_2V) derivatives of diphenylurea. References 8: 4 Russian, 4 Western.

UDC 547.26'118

N-Alkyl-N-(Alkoxy carbonyl)Amidophosphoric Acid Halides and Isocyanates

18410218D Leningrad ZHURNAL OBSHCHEY
KHIMII in Russian Vol 58 No 12, Dec 88 (Manuscript
received 30 Jun 87) pp 2766-2771

[Article by N. K. Mikhaylyuchenko, B. N. Kozhushko, and V. A. Shokol, Institute of Organic Chemistry, Ukrainian Academy of Sciences, Kiev]

[Abstract] Continuing the study of the Arbuzov reaction with low-nucleophilic compounds of trivalent phosphorus, the authors found that dialkylfluoro- and trialkylfluorophosphites easily react with N-chloro-N-alkylcarbaminic acid esters. The reaction is somewhat slower with the trialkylphosphites, but the alkylesterchlorides and fluorides are obtained with higher yields. References 5: Russian.

UDC 547.26'118

Reaction of Diphenyl- and bis(1,1,3-Trihydroperfluoropropyl)-Isocyanatophosphites With Idene Derivatives of β -Dicarbonyl Compounds

18410218E Leningrad ZHURNAL OBSHCHEY
KHIMII in Russian Vol 58 No 12, Dec 88 (Manuscript
received 10 Jul 87) pp 2771-2774

[Article by I. V. Konovalova, E. K. Khusnutdinova, L. A. Burnayeva, G. Kh. Fakhrutdinova, and A. N. Pudovik, Kazan State University imeni V. I. Ulyanov-Lenin]

[Abstract] A study is made of the reaction of diphenyl- and bis(1,1,3-trihydroperfluoropropyl)isocyanatophosphites with ethylidene acetyl acetone, ethylidene acetoacetic ether, and benzylidene acetyl acetone. Attachment products with a phosphorane structure were produced that, when heated, were converted to substituted 1,2-oxaphosphol-4-enes with a 4-coordinated phosphorus atom. References 3: Russian.

UDC 542.91:547.1'118

**Reaction of
S,S'-Diethyltrimethylsilyldithiophosphite With
Aldehydes. Catalysis by Amines**

18410218F Leningrad ZHURNAL OBSHCHEY
KHIMII in Russian Vol 58 No 12, Dec 88 (Manuscript
received 25 Dec 87) pp 2799-2800

[Article by V. A. Alfonsov, I. S. Nizamov, A. G. Trusenev, E. S. Batyyeva, and A. N. Tudovik, Institute of Organic and Physical Chemistry imeni A. Ye. Arbuzov, Kazan Affiliate, USSR Academy of Sciences]

[Abstract] Siloxy derivatives of P^{III} acids are highly reactive for the carbonyl group of aldehydes and ketones and lead to the formation of 1-siloxyphosphonate derivatives. This article studies the same reactions with silylphosphites containing an alkylthio group at the phosphorus atom. It is found that S,S'-diethyltrimethylsilyldithiophosphite does not react with benzene and acetic aldehydes at 20 °C. Under conditions of nucleophilic catalysis by triethylamine, the compounds do react, however, and form S,S'-diethyl-1-trimethylsiloxyalkyldithiophosphonates. The reaction is exothermic in the case of acetic aldehyde. The structure of the products was demonstrated by IR, NMR, and ¹H and ³¹P spectroscopy, as well as by elemental analysis. Reference 1: Russian.

UDC 676.16

Chemicomechanical Mass of Birch Fiber

18410204C Riga KHIMIYA DREVESINY in Russian
No 2, Mar-Apr 89 (Manuscript received 10 Dec 87)
pp 44-47

[Article by Ye. A. Balashova, L. S. Sakhomenko, A. I. Bobrov, V. K. Komarov, and N. S. Yenikolopyan, Institute of Synthetic Polymer Materials, USSR Academy of Sciences; Institute of Chemical Physics, USSR Academy of Sciences; Central Scientific Research Institute of Paper]

[Abstract] A study is made of the possibility of using a dual-snake mixer to break down wood chips into fibers. The chips were treated by heat and chemicals to soften the lignin and weaken the bonds between fibers. Next, they were worked in the dual-snake mixer, which exposed them to shear deformations at high pressure. The mean length of the fibers produced was determined and the fractional composition of the material measured.

The use of sodium hydroxide and sulfite yielded longer fibers than did the use of sodium hydroxide alone. The addition of sodium sulfite decreased the mass yield by 6.5 percent but significantly improved paper-making properties. Figure 1; References 6: 3 Russian, 3 Western.

UDC 676.16

**Ultrastructure of Fibers in Chemical-Mechanical
Mass of Birch Wood Obtained Under Plastic
Flow Conditions**

18410204D Riga KHIMIYA DREVESINY in Russian
No 2, Mar-Apr 89 (Manuscript received 10 Dec 87)
pp 48-51

[Article by Ye. A. Balashova, Z. Ye. Bryantseva, L. S. Sakhonenko, A. I. Bobrov, and M. S. Yenikolopyan, Institute of Synthetic Polymer Materials, USSR Academy of Sciences; Institute of Chemical Physics, USSR Academy of Sciences; Central Scientific Research Institute of Paper]

[Abstract] A method involving exposing birch to high pressure and shear stress was used to produce a chemicommechanical mass for the manufacture of paper products. Histochemical analysis of the mass was performed, and the degree of delignification was determined by the Hertzberg reaction. The fibers were examined under a scanning electron microscope: a unique folded structure that indicated the softening and deformation of both the outer portion of the fiber and the inner volume was revealed. The wood material was separated into individual fibers with minimum length reduction and non-uniformly modified surfaces, with the characteristic folded structure consisting of swollen amorphous material. These factors significantly increased the strength of the mass produced. Figures 3; References 5: 4 Russian, 1 Western.

UDC 634.0.813.4:547.455.69

**Cellulose-Containing Raw Material for Production
of Levoglucosan by Rapid Thermolysis**

18410204E Riga KHIMIYA DREVESINY in Russian
No 2, Mar-Apr 89 (Manuscript received 02 Dec 87)
pp 69-73

[Article by M. A. Pluminsh, Ya. G. Zandersons, and R. V. Vitolinya, Institute of Wood Chemistry, Latvian SSR Academy of Sciences]

[Abstract] Results are presented from a study of various types of cellulose-containing materials, i.e., production wastes, which are of practical interest as widely available raw materials for the production of levoglucosan. The yield of levoglucosan and water-soluble resin from wood not treated by sulfuric acid was low, contradicting previous studies. Catalytic quantities of sulfuric acid were found to be necessary to achieve high yields of volatile products. Cellolignin from deciduous varieties and corn were judged to be promising raw materials for rapid

thermolysis. The residual quantity of sulfuric acid in material subjected to thermal destruction should be about 0.1 percent of the absolutely dry mass, which corresponds to a pH of 2.0-2.5. The optimal yield is achieved at 370-410°C with a ratio of superheated steam to cellulignin of 4-5 kg/kg. References 10: 7 Russian, 3 Western.

UDC 547.724.1:634.0.861

Production of Furfural and Use of Lignocellulose Residue To Produce Fiber Materials

18410204F Riga *KHIMIYA DREVESINY* in Russian No 2, Mar-Apr 89 (Manuscript received 22 Feb 88) pp 83-86

[Article by Y. Paytik and Yu. Ladomerskiy, Wood Technology Institute, Zvolen, CSSR]

[Abstract] Experiments were undertaken to produce furfural from beech chips by single-stage and two-stage methods using H_3PO_4 as the catalyst. The partially destroyed lignocellulose residue obtained in this manner was used to produce cellulose and manufacture wood-fiber boards. The advantages of the single-stage method include a higher furfural yield, simpler technology, and lower power consumption. With the two-stage method, the most suitable catalyst is sulfuric acid at not over 2 percent. To increase the effectiveness of the two-stage

method, the furfural yield must be increased by developing a more effective technology to dehydrate the pentose solutions. References 4: 1 Russian, 3 Western.

UDC 634.0.824.88

Study of Delay in Burning of Wood Fiber With Cyclophosphazines Present

18410204G Riga *KHIMIYA DREVESINY* in Russian No 2, Mar-Apr 89 (Manuscript received 18 May 87; after revision 26 Apr 88) pp 101-104

[Article by Ye. N. Pokrovskaya, T. G. Beltsova, and V. I. Siborov, Moscow Institute of Construction Engineering imeni V. V. Kuybyshev]

[Abstract] The delay in the burning of wood fiber in the presence of several phosphazines was studied by the pyrolytic gas chromatography and EPR methods. The specimens used consisted of pine chips that had been preliminarily extracted with an alcohol-benzene mixture and dried to a constant mass. The quantity of CH_4 and CO produced by pyrolysis was always less when cyclophosphazines were present, and this increased the flame resistance of the wood fiber. The best fire-protective properties are those of a composition based on monomethoxycyclophosphazine, which corresponds to the highest concentration of paramagnetic centers during pyrolysis of the wood in the presence of the phosphazines. Figures 2; References 10: 7 Russian, 3 Western.

UDC 547.593.213+632.953

**Synthesis and Antiviral Properties of
Cyclohexanol Aminoesters**

18410223E Minsk IZVESTIYA AKADEMII NAUK
BELORUSSKOY SSR: SERIYA KHIMICHESKIKH
NAUK in Russian No 2, Mar-Apr 89 (Manuscript
received 14 Sep 87) pp 66-68

[Article by N. S. Kozlov, V. N. Kovaleva, Ye. I. Veher,
Ye. I. Boreko, G. V. Vladyko, and L. V. Korobchenko,
Institute of Physical Organic Chemistry, Belorussian

Academy of Sciences; Belorussian Scientific Research
Institute of Epidemiology and Microbiology, Belorussian
Ministry of Public Health]

[Abstract] Aminoesters, which are derivatives of cyclohexanol, were synthesized in two stages. In the first stage, acylation of cyclohexanol by monochloroacetic acid chloride yields a complex cyclohexanol chloroester. In the second stage, mobile chlorine is replaced by an amino group of a secondary amine: diethylamine n-dibutylamine, piperidine, morpholine, or hexamethylenimine. Two of the compounds were found to have antiviral properties. One was active against herpes and vesicular stomatitis, the other against variolovaccine and classical avian plague. References 6: Russian.

UDC 662.74:621.78:547.672:661.21:667.629.4

Products of Thermolysis of Anthracene With Sulfur for Thermo- and Photostabilizers

*18410221B Moscow KOKS I KHIMIYA in Russian
No 4, Apr 89 pp 28-31*

[Article by I. A. Kobozeva, candidate of technical sciences, N. V. Prilutskaya, candidate of chemical sciences, and I. A. Goncharenko, Kharkov Polytechnical Institute]

[Abstract] A study is presented of the conditions for producing stabilized additives compatible with paint and varnish materials by thermolysis of anthracene with sulfur. The composition and structure of the products produced are also determined. Thermolysis was performed with an anthracene-sulfur ratio of 1:2 in an inert medium at 300°C. The reaction product was taken off every 20 minutes for 1 hour, and the reaction was tested by IR, UV, and EPR spectroscopy; gas-liquid chromatography; and x-ray structural analysis. Oligomer arylene sulfides were produced that were soluble in organic solvents. EPR spectroscopy indicated the presence of paramagnetic particles yielding a stabilizing effect. The product was found to be an effective pentaphthal binder stabilizer. Figures 5; References 7: Russian.

UDC 662.749.39'38.001.5

Study of Rapid Liberation of Alpha Fraction of Medium-Temperature Pitch

*18410221C Moscow KOKS I KHIMIYA in Russian
No 4, Apr 89 pp 31-33*

[Article by I. M. Markelova, N. A. Shikova, and P. I. Zolkin, candidate of technical sciences, Scientific Research Institute of Graphite]

[Abstract] A new method has been developed for analyzing coal-tar pitch for the content of substances insoluble in toluene (the so-called alpha fraction). The method is based on a turbidimetric method involving dispersion of a pitch suspension in toluene by an ultrasonic dispersing unit and determination of the attenuation of light flow in the suspension, comparing it with a calibration graph. This article discusses an aliquot method of constructing a calibration graph for the analysis. This method is found to be more accurate than the previous method, which was based on the use of pitch specimens with known alpha-fraction concentration. Individual calibration graphs must be constructed for pitch specimens from different plants. Figure 1; References 3: Russian

UDC 662.74:661.522.2

Marketing Ammonium Sulfate

*18410221D Moscow KOKS I KHIMIYA in Russian
No 4, Apr 89 pp 33-35*

[Article by A. V. Saltanov, Kuznets Metallurgical Combine]

[Abstract] Since collective farms have been required to pay for the fertilizer delivered to them, they are no longer indifferent to the quantities and quality of fertilizer supplied by the state. This has resulted in the appearance of a fertilizer surplus in the nation. This is particularly true in the case of relatively ineffective fertilizers such as ammonium sulfate, which has only a 21 percent nitrogen content. Furthermore, it was a mistake to deliver ammonium sulfate to collective farms in hopper railroad cars since the farms have no equipment for unloading or even for covered storage of such cars. Further difficulties arise in applying bulk ammonium sulfate to the fields, bagged products being much more suitable. The international market is promising; however, the American firm Phillips Brothers, for example, will only buy ammonium sulfate in batches of 20,000 tons, which is sufficient to fill a ship. An individual chemical plant might need 6 months to accumulate this much product, during which time the market could change. The author suggests immediate conversion to 100 percent bagged production of ammonium sulfate, conversion to the production of concentrated ammonia water where possible, creation of a syndicate to generate larger quantities, reduced production of ammonium sulfate, construction of large storage areas, and the creation of a central office for gathering data on the production and consumption of the material both in the USSR and abroad.

UDC 662.749.2+543.544

Automatic Industrial Chromatograph for Determining Losses of Benzene Hydrocarbons

*18410221E Moscow KOKS I KHIMIYA in Russian
No 4, Apr 89 pp 43-36*

[Article by V. N. Pinchugov, N. N. Buchneva, S. G. Khachatryan, Altay Coke and Chemical Plant]

[Abstract] An industrial Neftekhim-Skep chromatograph is now in successful use at the Altay Coke and Chemical Plant for the determination of losses of benzene hydrocarbons with the coke reflux gas. The basic technical specifications of the installation are presented. An absorbing system is used to remove impurities that destabilize the operation of the separating columns. A contact manometer is used to disconnect the sensing element of the chromatograph when the pressure of the carrier gas drops below a certain point to avoid damaging the sensor. The absorber system is online only when gas samples are taken from the stream, thus increasing the life of absorber solutions. The use of the

chromatograph allows more timely control of the technological process of removing benzene from the gas. Figure 1; References 6: Russian.

Scientific-Technical Progress in Production of Small-Tonnage Lubricants

18410222A Moscow *KHIMIYA I TEKHOLOGIYA TOPLIV I MASEL* in Russian No 4, Apr 89 p 2-6

[Article by G. I. Cherednichenko, Director General, "MASMA" Scientific Production Association]

[Abstract] The Scientific Production Association for small-tonnage lubricants ("MASMA") was created in 1982 from the All-Union Scientific Research and Planning and Design Institute of the Petroleum Refining and Petrochemical Industry, the Lvov Planning Affiliate, and the Drogobych Experimental Plant. In 1988, the Berdyanskiy and Lvov Experimental Oil Production Plants were added. This association performs scientific, planning-design, engineering-technical, and economic research in order to develop, test, produce, and apply small-tonnage lubricants such as plastic and semiliquid lubricants, lubricating and cooling process products and additives for them, special oils and fluids, asphaltene-resin softeners, cable masses, and other products. Some of the research conducted by the association is very briefly described.

UDC 665.756:665.6.013.044.17

Factors Accelerating Scientific and Technical Progress in Lubricant Production

18410222B Moscow *KHIMIYA I TEKHOLOGIYA TOPLIV I MASEL* in Russian No 4, Apr 89 p 6-7

[Article by A. A. Pavlov, Z. M. Zaborskaya, and L. O. Yurtin, All-Union Scientific Research, Production and Design Institute of Petrochemistry]

[Abstract] There are reserves for improving the production and consumption of lubricants. The specifics of scientific and technical progress in the subbranch of industry responsible for the production of laminar lubricants were studied. Opportunities include replacement of batch processes by continuous processes, installation of modern equipment, and creation of a reserve capacity to improve the satisfaction of demand, currently only at 50 percent. References 3: Russian.

UDC 658.562

Increasing Quality of Small-Tonnage Lubricant Materials and Additives

18410222C Moscow *KHIMIYA I TEKHOLOGIYA TOPLIV I MASEL* in Russian No 4, Apr 89 p 8

[Article by M. A. Kravtsov, A. A. Kovalev, and N. I. Svintsov, All-Union Scientific Research, Production, and Design Institute of Petrochemistry]

[Abstract] The most important trend in increasing the quality of small-tonnage lubricant materials and additives is the rapid introduction of scientific research work and new progressive technological processes and materials. It is particularly important to renew the assortment of products produced and improve production structures. By the end of the current 5-year-plan, the quality of 26 products is to be improved, 43 are to be taken out of production, and more than 50 new lubricants and additives are to be put in production. Implementation of the "quality" program is intended to increase the volume of production of products of the highest category of quality by 30 percent.

UDC 338.45:665.767

Development of Production of Lubricating-Cooling Material

18410222D Moscow *KHIMIYA I TEKHOLOGIYA TOPLIV I MASEL* in Russian No 4, Apr 89 pp 9-12

[Article by G. I. Cherednichenko, Yu. S. Volkov, and I. G. Turyanchik, All-Union Scientific Research, Production, and Design Institute of Petrochemistry]

[Abstract] Lubricating and cooling materials are used to allow metal-cutting operations to proceed at higher speeds. The production of such materials is developing in the direction of improving the quality, increasing the output of new products, expanding the assortment, improving the structure and economy, and increasing the growth rates. The mean annual growth rates of production of such materials for metal working was 3.8 percent in 1971-1985, including 2.8 percent for metal cutting, 15.2 percent for stamping and 23.2 percent for rolling. The total output of products for sheet rolling of metals has increased by a factor of 2.1 since 1977. In spite of these positive trends, the demand for these materials has not been fully met. As production is expanded, preference should be given to water-miscible materials, which improve fire safety and reduce the consumption of scarce raw materials. Batch processes must be replaced by continuous processes. This can yield a savings of about 600,000 rubles per year for a 50,000-ton plant. References 10: Russian.

UDC 621.78.065.2

New Petroleum Oil-Based Quenching Fluids

18410222G Moscow *KHIMIYA I TEKHOLOGIYA TOPLIV I MASEL* in Russian No 4, Apr 89 p 23-25

[Article by T. I. Tkachuk, B. K. Sheremeta, N. Ya. Rudakova, and M. R. Orazova, All-Union Scientific Research, Production, and Design Institute of Petrochemistry]

[Abstract] In developing new hardening oils, particular attention must be given to increasing their cooling capacity for alloy steels, improving the antioxidant stability under long-term usage conditions, improving the

surface quality of products hardened, and decreasing evaporation while improving fire safety. These requirements were used as the basis for selecting the optimal component composition of oils, including the base oil and additives. The greatest cooling rate was found in oils with a paraffin-naphthene composition due to the lower viscosity. Additives must be selected on the basis of their thermal stability for the initial period of film boiling. As the thermal stability of the additives decreases, the ability of the oil to reduce the length of film boiling increases. A direct relationship was established between the cosine of the contact wetting angle and the cooling rate. Introduction of alkylphenol antioxidants can significantly improve the stability of hardening oils. Ash-free detergent additives significantly improve the surface quality of the steels hardened. Figures 7; References 4: Russian.

UDC 662.731:539.26

Pore Structure of Coke From Oxidized Peat

18410223F Minsk IZVESTIYA AKADEMII NAUK
BELORUSSKOY SSR: SERIYA KHIMICHESKIKH
NAUK in Russian No 2, Mar-Apr 89 (Manuscript
received 17 Feb 88) pp 82-85

[Article by V. V. Maryganova, V. K. Zhukov, P. L. Falyushin, and M. F. Rayskaya, Institute of Peat, Belorussian Academy of Sciences]

[Abstract] A detailed study is presented of the pore structure of coke produced from several types of peat by x-ray low-angle scattering. All of the cokes studied had a mixed pore structure with predominant development of microscopic pores. The method of low-angle x-ray scattering indicated that spontaneous heating has a significant influence on the pore structure parameters of the carbonized products, which alters the distribution of individual types of pores in the cokes and significantly

increases total porosity and microscopic pore volume (with the coke consisting primarily of closed pores). Figure 1; References 9: 8 Russian, 1 Western.

541.182.65:66.084

Effect of Ultrasound on Rheological Properties of Suspensions of Askangel on Petroleum

18410241C Tbilisi IZVESTIYA AKADEMII NAUK
GRUZINSKOY SSR: SERIYA KHIMICHESKAYA in
Russian Vol 15 No 3, Jul-Aug-Sep 89 (manuscript
received 15 Jun 87) pp 201- 204

[Article by Ye. I. Kobakhidze, L. V. Kuridze, L. K. Dzhaparidze, and M. G. Shishniashvili, Physical Organic Chemistry Institute imeni P. G. Melikishvili]

[Abstract] Ultrasound is one of the most effective means of altering the colloidal chemical and rheological properties of disperse systems. Depending on the conditions and the acoustic parameters, ultrasound can either disperse or aggregate aqueous dispersions of clayey minerals. In a previous work a method was developed for obtaining nonaqueous claylike suspensions by grinding clay and a petroleum product in a ball mill in the presence of a hydrophobic agent. Stable and thixotropic clay suspensions may also be obtained with relatively high-solid phase and hydrophobic agent contents. In the present work ultrasound was used to facilitate solid-phase dispersion to give stable clayey suspensions of Askangel montmorillonite clay in a Georgian crude oil with a relatively low content of solid-phase and hydrophobic agents. Thus, a 10 percent suspension of natural Askangel clay in crude oil became stable after 6-10 minutes of ultrasonic treatment at 22 kHz. Although the filtration rate drops, structure formation does not take place. After 15 minutes of treatment, the clay particles become aggregated, the suspension separates, and the dispersed phase settles out. Figures 2; references 8: 7 Russian, 1 Western.

UDC 541.1:534.29

Mechanism of Initiation of Ultrasonic Glow in Polymers*18410178F Moscow ZHURNAL FIZICHESKOY KHIMII in Russian Vol 43 No 3, Mar 89 (manuscript received 10 May 88) pp 775-777*

[Article by M. A. Margulis and A. F. Dmitriyeva, Organic Synthesis Research Institute (A-U)]

[Abstract] The phenomenon of polymer glow resulting from exposure to powerful ultrasonic sound waves has been reported previously. It was also established that the light is formed during cavitation in the polymer as a result of the melting of a thin layer of polymer immediately adjacent to the ultrasonic source (waveguide). Light emission with cavitation (sonoluminescence) in highly viscous liquids such as molten polymers makes it possible to approach the solution of many important energy-producing chemical and physical effects. In the present work a theoretical analysis is presented on the thermal and electrical phenomena associated with cavitation in molten polymers. It is pointed out that other thermal theories do not allow initiation of sonoluminescence in polymer melts to be seen as the result of bubble collapse. Sonoluminescence can be explained on the basis of a new electrical theory correlating luminescence with the formation of an electrical charge on newly formed surfaces of cavitation bubbles and their discharge following the loss of bubble stability. Figure 1; references 8: 6 Russian, 2 Western.

UDC 678.4:[678.01:593.3]

Influence of Mechanical Stress on Kinetics of Chemical Reactions in Cross-Linked Elastomers*18410183A Moscow KAUCHUK I REZINA in Russian No 3, Mar 89 pp 6-8*

[Article by A. A. Sokolovskiy, E. F. Vaynshteyn]

[Abstract] A study is made to determine the reasons for the effects of stress on the kinetics of chemical processes in cross-linked elastomers from the standpoint of changes in the thermodynamic state of the system upon deformation. Several versions of the influence of stress on the rate constant of a first-order reaction are studied: (1) when the rate constant K increases with an elevation in stress or deformation as a result of a substantial influence of the action of tension on the free energy of formation of the initial state and its weak influence on the transition state; (2) when K is independent of stress and the influence is identical on the initial and transition states; and (3) when K diminishes as a result of the predominant influence of stress on the free energy of formation of the transition state. It is suggested that the increase in entropy of rubber should lead to an increase in observed activation energy of reactions involved in the breaking of chemical bonds, thus increasing thermal stability. This is confirmed by the increase that is

observed in activation energy of thermochemical processes in molecular chain sections rich in acrylonitrile components when molecular mobility increases in vulcanisates based on butadiene-nitrile rubber, as well as by the thermal and thermal-oxidation resistance that is higher in plasticized cross-linked elastomers than in nonplasticized ones. Figures 1; references 12 (Russian).

UDC 542.944.13.678.763.2

Study of Initial Stage of Chlorination of Polychloroprene*18410183B Moscow KAUCHUK I REZINA in Russian No 3, Mar 89 pp 11-13*

[Article by E. S. Voskanyan, K. A. Torosyan, V. Yu. Sarkisyan, K. K. Yutudzhyan]

[Abstract] A study is made of the initial stage of chlorination of polychloroprene (the interaction of one chlorine molecule with an elementary rubber component), as well as of a model low-molecular analog—2-chloro-2-butene. It was found that, independent of the conditions of chlorination, hydrogen chloride is separated in the initial stage of the process. As temperature increases to 60°C from 0°C, the degree of substitution drops from 60% to 24%. Chlorination conditions have virtually no effect on reaction rate in the initial stage. A comparison of the initial stage of the chlorination of polychloroprene and polyisoprene indicates that the substitution of an electron-donor methyl group for an electronegative halogen atom leads a sharp drop in reaction rate and degree of substitution. The substitution of nonpolar CCl_4 for low-polarity dichloroethane and chloroform promotes substituting chlorination. The authors found that the chlorination of 2-chloro-2-butene in solution leads to the a substitution of CCl_4 and CHCl_3 that results in an increase of the percentage of substituting chlorination to 70% from 55%. It is suggested that partial cyclization of the polymer chains may occur in the first stage with the formation of 6-member rings. After the chlorine content reaches 56% (by mass) as a result of attachment and substitution, further chlorination is much more difficult, reaching a maximum of 63-67% (by mass). In this stage, light, initiators and inhibitors of radical-chain processes have a strong influence on the process. Figure 1; references 12: 11 Russian, 1 Western.

UDC 66.064-278-98

Hydrodynamics of Hollow Fiber Membrane Devices*18410184F Leningrad ZHURNAL PRIKLADNOY KHIMII in Russian Vol 62 No 3, Mar 89 (manuscript received 11 Oct 88) pp 578-580*

[Article by N. A. Martsulevich, V. N. Gomolitskiy, Yu. G. Chesnokov, and N. N. Smirnov]

[Abstract] Hollow-fiber membranes appear to be the most promising type of device for the separation of

liquids. It has many advantages over other types and may be used in molecular biology, genetic engineering, biotechnology, medicine, and the pharmaceutical and food industries. This includes ultrafine separation of solutions and suspensions of biologically active substances (BAS) from low-molecular weight fractions, concentration of BAS solutions and suspensions, fractionation of BAS solutions, and production of biological preparations by surface cultivation. The presence of BAS imposes further requirements on the hydrodynamics of the membrane device. Thus, laminar flow must always be maintained because turbulent flow of BAS particles results in their disruption. Also, the working solution must be fed evenly over the entire surface of the fiber so that the various elements of the fiber act uniformly. These conditions are met only if the flow of the initial solution is evenly distributed over the fiber bundle front. If not, the volume flowing through the center exceeds that along the periphery. The degree of nonuniformity of input flow is a function of the hydrodynamics of the system. In the present work a quantitative estimate was made of the nonuniformity of flow distribution at the fiber bundle front as a function of basic geometric parameters of the input chamber and the hydraulic resistance of the fiber bundle. A formula is derived which relates input chamber dimensions and geometry to flow distribution. Figure 1; references 2 (Russian).

UDC 678.742.3:66.095.262:66.097

Gas-Phase Polymerization of Propylene Using Highly Active Catalysts

18410207A Moscow PLASTICHESKIYE MASSY in Russian No 4, Apr 89 pp 11-14

[Article by I. A. Voloshin, N. P. Shestak, G. N. Kashirina, Yu. N. Shestak, L. S. Pavlikova, L. I. Temchenko, and S. P. Tereshina]

[Abstract] One promising trend in the production of polypropylene using highly active catalysts is that of synthesizing the polymer in a medium of the monomer, gas-phase polymerization, and modification. The combined process yields impact-resistant copolymers when the reaction occurs in a mass in one reactor and gas-phase polymerization is performed in a second reactor. This article studies gas-phase polymerization of propylene by using microspherical titanium trichloride and a titanium-magnesium catalyst. The catalytic systems studied can produce polypropylene powders with broad range of particle-size distributions, 160-400 μm , depending on the catalyst used. The properties of the polypropylene produced are equal to polypropylene produced by the traditional suspension process in a solvent. Figures 2; References 8: Russian, 4 Western.

UDC 678.742.2=136.744.422.046.2:537

Conductivity of Ultrathene Composites With Technical-Grade Carbon

18410207B Moscow PLASTICHESKIYE MASSY in Russian No 4, Apr 89 pp 17-18

[Article by A. F. Tikhomirov, S. V. Kazakov, Yu. A. Polonskiy, Yu. Kruchek, and Yu. I. Firsov]

[Abstract] A study is made of the properties of a conducting composite based on ultrathene (a copolymer of ethylene and vinyl acetate) type 11306-075 plus type P-267e technical carbon filler. The composite also contained the cross-linking agent percadox (0.9 percent). The structure of the conducting composite consisted of agglomerates of conducting particles distributed in a polymer matrix. An equation is presented for the probability of the conduction of an electrical current as a function of the volumetric content of the filler and agglomerates. The equation yields good agreement with experimental data. Figure 1; References 4: Russian.

UDC 678.664-19-13.01

Properties of Binary Mixture of Thermoplastic Polyurethanes and Butadiene-Cyanoethylmethacrylate Copolymer

18410207C Moscow PLASTICHESKIYE MASSY in Russian No 4, Apr 89 pp 18-22

[Article by Ye. Yu. Borisova, T. A. Yerykalova, S. V. Vladychina, V. N. Kuleznev, V. M. Parfeyev, and S. V. Peresypkina]

[Abstract] A study is made of the influence of butadiene-cyanoethylmethacrylate copolymers with various chemical natures and compositions on the mechanical properties and cold resistance of binary mixtures consisting of thermoplastic polyurethanes plus the copolymer. The urethanes used were based on the complex polyester 4-4'-diphenylmethanediisocyanate and 1,4-butanediol modified by copolymers of butadiene with CEMA of different solubilities, as well as a copolymer of butadiene with CEMA and methacrylic acid. It is found that the cold resistance of the films produced can be improved by modification using copolymers of butadiene with cyanoethylmethacrylate, the maximum cold resistance being achieved at a specific modifier polarity. Figures 2; References 9: Russian.

UDC 678.742.3-135.473.132:539

Interaction of Structure and Properties of Block Copolymer of Propylene With Ethylene

18410207D Moscow PLASTICHESKIYE MASSY in Russian No 4, Apr 89 pp 31-34

[Article by E. N. Groznaya, L. N. Yaropolova, and E. A. Mayer]

[Abstract] In order to determine the reason for the decrease in the strength of block copolymer specimens that are injection molded, the properties of pressed and cast specimens of type 22015 block copolymer containing 11 percent ethylene groups were compared. It is found that during pressing, empirical monitoring of properties of the material is possible without a careful analysis of the structural conversions occurring in the material. The block copolymer of propylene with ethylene synthesized by using the improved technology with highly effective TiCl_3 has a valuable combination of physical and mechanical properties. However, to achieve these properties during injection molding requires modification of the structure by heat treatment of the product or removal of β -nucleators to eliminate phase heterogeneity in the polypropylene matrix. Figures 2; References 9: 1 Russian, 8 Western.

UDC 678.746.222.017:539.411.5

Identification of Stressed State of Standard Specimens of Impact-Resistant Polystyrene During Determination of Mechanical Properties

18410207E Moscow PLASTICHESKIYE MASSY in Russian No 4, Apr 89 pp 36-40

[Article by Yu. V. Nikitin, T. G. Shlyakhova, N. M. Yefremova, and T. A. Burdeynaya]

[Abstract] A method has been developed to identify the stressed state of standard specimens when determining the basic mechanical properties of specimens or batches of polymer that differ in their rheologic characteristics. Experiments were performed on impact-resistant polystyrene consisting of a styrene homopolymer with a rubber phase dispersed within it. Specimens were produced by different polymerization methods and differed in strength and deformation characteristics as well as rheologic properties. Equations are produced that yield errors of 8 to 16 percent, which is comparable to the errors achieved in an experimental determination of the mechanical properties, thus indicating that the calculations are satisfactorily accurate. Figures 3; References 7: 5 Russian, 2 Western.

UDC 677.494.745.32:677.0619

Producing Conductive Yarn From Metallized Orlon and Dacron Fiber Mixture

18410219A Moscow KHIMICHESKIYE VOLOKNA in Russian No 2, Mar-Apr 89 (Manuscript received 12 Nov 87) pp 19-21

[Article by Kh. T. Kochu, D. N. Akbarov, and A. K. Yenikeeva]

[Abstract] A process is described for making yarn with certain desired electrical and physicomachanical properties based on modified conductive fiber produced by chemical-galvanic nickel plating of orlon fiber. The variation of resistivity and mechanical strength were determined as functions of the ratio of components in the

mixture, density per unit length, and twisting rate. It was shown that the variation of tensile strength as a function of composition is linear, which is unusual for this fiber. Equations were derived to describe the changes in the yarn's properties to allow production of materials with the desired characteristics. Figures 3; References 3: Russian.

UDC 677.494-96:537.311

Scale Factor in Electrophysical Properties of Lanom Fiber

18410219B Moscow KHIMICHESKIYE VOLOKNA in Russian No 2, Mar-Apr 89 (Manuscript received 20 Apr 88) pp 26-28

[Article by A. A. Nikitin, S. N. Vilesova, and R. I. Chigrineva]

[Abstract] Studies were made to determine the relationship between the resistivity of elementary lanom fibers and cords made of the fibers. The resistivity of the fiber is found to consist of the sum of resistances with exponentially distributed resistivity. The distribution of the resistivity of such a fiber is described as the sum of several distributions, with the mean value increasing with increasing cord length. The variation of critical content of parallel-connected elementary fibers as a function of cord length satisfactorily describes the scale factor of the electrophysical properties. Increasing the fiber content increases the variation in resistivity of elementary sectors. Mathematical models are presented that describe the properties of the fiber. The scale factor of the resistivity is found to depend on the exponential distribution of electrophysical properties per unit elementary fiber section. Figures 3; References 6: 3 Russian, 3 Western.

UDC 678.675:536.495:541.24

Change in Molecular-Mass Characteristics of Aromatic Copolyamide During Polycondensation

18410219C Moscow KHIMICHESKIYE VOLOKNA in Russian No 2, Mar-Apr 89 (Manuscript received 13 May 88) pp 29-30

[Article by O. I. Manina, L. M. Braginskaya, V. I. Komissarov, S. V. Shorin, I. F. Kuyantseva, A. V. Tokarev, and G. I. Kudryavtsev]

[Abstract] Copolyamide was produced by low-temperature solvent polycondensation in dimethylacetamide with added lithium chloride. Studies were performed by sedimentation in an ultracentrifuge at 60,000 rpm, 25°C. The specimens were 0.2-0.05 percent solutions of unfractionated copolymer in DMAA with 3

mass percent lithium chloride. As the reaction continued, the dynamic viscosity increased rapidly at certain molecular mass values, indicating the presence of a significant structural component in the system. Fiber strength was found to increase with an increase in molecular mass from 5,400 to 7,300. Further increases in molecular mass caused a decrease in strength due to the difficulty of processing strongly structured spinning solutions. References 2: Russian.

UDC 677.529.064:61

Use of Carbon Materials in Traumatology and Orthopedics

18410219D Moscow *KHIMICHESKIYE VOLOKNA in Russian No 2, Mar-Apr 89 (manuscript received 14 Jun 88) pp 30-31*

[Article by M. Ye. Kazakov, N. G. Bizyakina, V. V. Prokimnov, V. S. Lebedev, I. A. Movshovich, N. S. Gavryushenko, and A. K. Zaratsyan]

[Abstract] Results are presented from studies intended to select domestic materials based on carbon fibers for replacement of tendons to meet the following requirements: elongation, not over 3 percent; satisfactory strength (50-100 MPa); suitability for long-term implantation in the human body; and no interference with proliferation of recipient tissue within the replacement material. Carbon fiber materials with the trade name Ural that were developed by the authors' group on the basis of hydrate-cellulose fiber meet these requirements. The fiber has optimal physicochemical characteristics, is not rejected by the body, and does not require additional surgery for removal. References 3: 2 Russian, 1 Western.

UDC 677.2:677.017

Properties of High-Strength High-Modulus Polyethylene Monofilaments

18410219E Moscow *KHIMICHESKIYE VOLOKNA in Russian No 2, Mar-Apr 89 (Manuscript received 18 Jul 88) pp 31-32*

[Article by V. I. Kuzub, V. N. Kaminskiy, S. A. Gordeyev, A. N. Dyachkov, Yu. I. Mitchenko, and A. S. Chegolya]

[Abstract] The physical and mechanical properties of high-strength and very high modulus monofilaments of polyethylene produced by gel technology are described. The monofilaments studied had a tensile strength of over 3 GPa and an initial modulus of about 1 to 0 GPa. The filaments have an activation energy of 110 kJ/mol and a structure-sensitivity coefficient of $2 \cdot 10^{-29} \text{M}^3$. Under long-term loading, the filaments lose up to 15 percent of their short-term strength, as predicted by the thermal fluctuation theory of strength. Figures 2; References 5: 4 Russian, 1 Western.

UDC 546.799.7

Using Solid Extractants in Radiochemistry

18410243A Leningrad *RADIOKHIMIYA in Russian Vol 31 No 3, May-Jun 89 (manuscript received 3 Oct 88) pp 1-8*

[Article by K. V. Barsukova, N. Yu. Kremlyankova, and B. F. Myasoyedov]

[Abstract] Selection of any particular method for separating actinide from other elements or isolating individual elements is contingent on the chemical properties of the solution being analyzed and the given problem. Normally sorption or extraction techniques are used for this purpose. Thus, extraction chromatography, which is widely used for analytical and preparatory purposes, combines both sorption and extraction by applying liquid extractants on pelletized carriers having a developed surface. A basic inadequacy of this method lies in the difficulty in preparing chromatographic columns having uniform working characteristics as well as in the weak bond between the carrier and the extractant, which gives nonreproducible results. The present work is a review of experimental work on the utilization of solid extractants to separate, isolate, and refine transplutonium elements, uranium, plutonium, and other elements such as Zr, Hf, Th, Y, and Sr. The review covers the synthesis, properties, and applications of solid extractants. Methods for separating and isolating transplutonium and rare earth elements from complex mixtures are presented. Figures 6; references 31: 24 Russian, 7 Western.

Early Days of Soviet Nuclear Industry Discussed

18410227B Moscow PRAVITELSTVENNYY VESTNIK
in Russian No 7, Apr 89 p 10

[Article under the "Pages of History" rubric by R. Kuznetsov, director of the I. V. Kurchatov Memorial House-Museum: "Uranium Project (From the Memoirs of Ye. Slavskiy)"; first three paragraphs are PRAVITELSTVENNYY VESTNIK introduction]

[Text] Yefim Pavlovich Slavskiy was born on 26 October 1898 in the old Cossack village of Makeyevka (this city is now in the Donbass) to a large peasant family. At the age of 13 he began working at the Makeyevka Metallurgical Plant. He joined the ranks of the Bolshevik Party as a young worker. During the years of the civil war, he fought in the First Cavalry Army. He began military service as a Red Army soldier and ended up regimental commissar. After attending school at the Mining Academy, he worked at various metallurgical plants, moving up the grades from engineer to director of the largest of the aluminum plants, the Dnepr and the Ural. In 1945 he became deputy people's commissar for nonferrous metallurgy of the USSR.

His life has been very eventful. But the main exploit was his participation in the creation of the nuclear shield of his country. In 1945 he became one of the assistants to the chief of the First Central Administration within the government. In 1947 he was chief engineer and director of the combine where the first industrial reactor was put into operation.

From 1957 to 1986 he has been the minister of the medium machine industry of the USSR. In 1986 he took his pension. For outstanding accomplishments in his difficult, but nationally important career, he was thrice awarded the title Hero of Socialist Labor and has been elected delegate to seven Party congresses. He is a member of the CPSU Central Committee.

As we get older, we involuntarily look to the past. And the most vivid memories probably concern that period of time when we began working on the "uranium project."

How did I, a specialist in nonferrous metallurgy, come to be involved with this? At the time, to be truthful, I did not have the slightest notion about atomic power. The extent of my knowledge in this field was limited to two articles by I. Ye. Tamm, which (when I read them in 1945) literally astounded me with the idea of the divisibility of the atom. When I was in school, the atom was considered to be the unassailable unit of matter. And now, it seemed, the scientists were laying their hands on its energy.

I first heard of the works of I. V. Kurchatov from the minister of nonferrous metallurgy, P. Lomako.

"Say, do you know the Beard?"—as Kurchatov was styled, after he allowed his beard to grow—he once asked me.

"No, I don't."

"For heaven's sake, you and he should get acquainted! The man is driving us insane with his project."

The electrode used in nonferrous metallurgy for the electrolytic production of aluminum was to be turned into graphite of unusual purity for the atomic boilers under development. Such substance occurs very seldom in nature, and only in negligible amounts. We needed 500 tons of highly pure graphite just for the first experimental reactor.

The only plant making the electrode material was in Moscow. I made a trip to the enterprise, familiarized myself with the whole procedure, and every morning I watched how the graphite mass was being purified of contaminants and how much pure graphite had been produced. My chief assistant was V. V. Goncharov, one of Kurchatov's helpers. I used to write down 10 kg, 20 kg, and each day reported to the Special Committee how much graphite we had produced. That is, until Goncharov came to the plant. He told me something that left me dumbfounded: so far, they had not accepted a single gram from us. At the plant, it was our belief that the product, once handed over, would be accepted. But it had been accepted only to check the degree of neutron absorption, that is, the purity of the graphite. And this did not yet suit the inspectors.

This had been reported to the Special Committee in charge of the "uranium project," which was a supervisory body over us. I rushed to find Lomako. "The matter is worse than bad. It seems we have failed." And in those days, this might result in.....Lomako and I raced to the plant. We made a scrupulous inspection. But there was no help for it: it simply could not yet produce pure graphite for nuclear physics.

And at this moment, I was summoned by A. P. Zavenyagin. Sure that the conversation would pertain to the graphite, I walked into his office, thinking "I am done for." But he greeted me warmly:

"Welcome to the team, old boy!"

"What do you mean," I gasped. "I don't know what is going on...."

"You have been transferred to the PGU."

"What PGU? What will I do there?"

"As you know, we are all a bit in the dark about it. A new project is under development. Any day now a decree will come out for Stalin to sign. And make sure you tell no one of this conversation."

It turned out that Igor Vasilyevich Kurchatov had raised the question of transferring me from nonferrous metallurgy to the PGU—First Central Administration—where I was to work as one of the assistants to B. L. Vannikov.

My feelings were hard to imagine. What could I do there? I knew absolutely nothing about this field! And had I not become a professional metallurgist, with fifteen years (more or less) experience? I was a figure of respect here—having earned three orders of Lenin. And now to start over again?

In a word, I went through a lot in connection with the future assignment. I told my wife nothing. I didn't talk to Lomako. Finally, I told him. Furious, he stormed into Mikoyan's office: "Now they are taking comrade Slavskiy away!" Mikoyan reassured him: "Relax. If a decision is made on this score, I won't be overlooked. They will ask my permission." We calmed down. But a day later the decision was made. Again I went to Mikoyan. But he said: "Who now will take it on himself to ask comrade Stalin to change the appointment? No matter. You will go and work there a couple of years and then come back to your nonferrous metallurgy."

So I went. And this "couple of years" turned into the rest of my life.

Thus, on 9 April 1946, I began working at the PGU as Vannikov's assistant. During the war, Vannikov had been a people's commissar for provisions. Apparently, this was why he was appointed to his present post. We set up our operation in Kirovskaya street. There was no special building. And they gave me five men to supervise! All first-class specialists. One of them kept going on about "fragments." I used to ask myself, what is he talking about? It later became clear that these were the fragments of atomic nuclei.

After my appointment, I used to show up at the graphite works in a new guise: no longer a supplier, but a requisitioning agent. But I also took charge of my former duties. On one occasion, Lomako and I were summoned to the Special Committee on the matter of the graphite. Government officials, our foremost industrial leaders, and Igor Vasilyevich Kurchatov were present. We waited in the foyer, literally shaking. I thought: the game is up now, with our false graphite data.

We went in. The chairman of the committee addressed the members: "Lomako and Slavskiy here have promised to take steps and do whatever is needed. What do you think, shall we consent?" Everyone nodded. They consented. We walked out with a feeling of being reborn.

Ultimately we did learn how to make pure graphite, and when I celebrated my 70th birthday in 1968, my colleagues made me two goblets out of this pure graphite. In remembrance of what all we had gone through for this.

The problems with the uranium were even more difficult. Its industrial extraction did not even exist in conversation, and 50 tons of uranium were needed to build the first experimental reactor F-1. Organization of its industrial extraction, elaboration of the radiochemistry, and solving of other no less important problems had

to be accomplished in the shortest of time. I was put in charge of these matters. And I also had to learn how to handle them.

Uranium prospecting had been carried out in 1946, but to a very limited extent. I still have photographs showing how it was taken out of the mine. Workers were driving donkeys, with logs tied to them like shafts. Another photograph shows these same donkeys on the return trip. Each one carries pouches, and in the pouches is uranium ore. The ore would be considered good grade if it had 0.1 percent uranium. All the rest was ballast rock. Imagine how much ore these donkeys had to carry!

Our atomic boilers at the time were only on paper, whereas in the West voices were shouting to start a nuclear war against the USSR. They were sure of impunity, since (as they thought) the USSR would need at least twenty years to create an atomic weapon. We had only just started digging the ground for the first atomic reactor, a very complex uranium radiochemical plant, and a plant for manufacture of an atomic weapon. And what a time it was! The European portion of the country was in ruins. Material resources were extremely meager. But the Party mobilized the best means and efforts, the best specialists, in this endeavor. And we all felt like we were in the front lines, at the cutting edge.

When the first experimental reactor was built, the physicists expected everything to go as planned. They loaded uranium into it, but no chain reaction occurred. Not enough uranium, they thought. They added more. Still no reaction. Then they blamed us. The uranium was poorly cleaned. Too many impurities. But it turned out, this was not true. The critical mass was too low for a chain reaction. They doubled it, they doubled it again, and finally it succeeded.

Kurchatov called me by telephone: "Come quickly! Very interesting business here!" He took me to the reactor and gave the order to start it. The regulating rod was lifted, and the chain reaction started! The men had built an "oilcan" amplifier, and it was rattling like a machine gun. Kurchatov was pleased. "It works!" The reactor was effectively started.

In the evening of this same day, 25 December 1946, in the presence of a government commission, a chain reaction was achieved in the reactor, built in no more than four months.

Next came the design and construction of a combine. On the initiative of Kurchatov, I was named director of this enterprise. Also working here were famous scientists: Aleksandr Pavlovich Vinogradov, Vitaliy Grigoryevich Khlopin, Yuliy Borisovich Khariton, Andrey Anatolyevich Bochvar, Anatoliy Petrovich Aleksandrov, and others.

At that time, professor Gromov was the chief engineer of the plant where plutonium was being obtained and purified. He was supposed to teach the others the technology that was to be adopted. But there were many

departments in the plant. To ensure secrecy, one group would be taught in a way that it would not know what the other groups were doing. While Gromov, a very skilled chemical technologist, studied the entire technology with all workers at the same time. He nearly got arrested for this. There was talk that he had divulged the secret. Each group should have been taught separately, it was claimed. I was almost the only one to defend him.

A huge project was set running. Truly astounding! An enormous number of scientists and leading specialists who had proved their worth were recruited for the new project. The situation was not simple: after all, these scientists and specialists were virtually isolated. They came to us only thanks to Kurchatov and his special personal charm.

The combine was built in the forest. The locality was spectacularly beautiful: a pine forest, a lake, mountains. At first, we lived in tents. Then we got cabins. We were still young and healthy and could put up with it. How we got our food and drink was not important. To be sure, the food and drink were excellent! We were happy and in good spirits. All the resources for our settlement were made available. And heaven forbid someone should fail to fill a supply order! All resources flowed through the Special Committee. Every week they received a report on how things were going.

In 1957 I became minister. At this time, N. S. Khrushchev was first secretary of the Central Committee, N. A. Bulganin was president of the Council of Ministers. Kurchatov was in good favor. Many issues would arise needing a decision at the highest level. Kurchatov would come and tell me: "Call Khrushchev for an appointment." I would make the call, and he would receive us at once.

During those days, genetics was still regarded as a "bourgeois pseudoscience." Yet Kurchatov took it on himself to defend Dubinin, and to Khrushchev no less! I told him: "Igor Vasilyevich, we respect and value you highly, but this is not your field. Don't interfere in the matter." He turned to me and said: "Get some money. Have a building constructed." We did so, and Kurchatov, unbeknownst to Khrushchev, created a department of biology, later radiobiology, where projects involving genetics were also organized. Just recently, this team was handed over to the Academy of Sciences, a full-blown institute of molecular genetics!

This was the happiest time in my life. And the most important thing was working with Kurchatov. To be honest, I never again met anyone as remarkable as him. He created not only the nuclear shield, but also a splendid team of scientists and engineers. From Kurchatov I learned that one may be self-sacrificing in science as well as on the battle field. He did not shrink from any job, however dismal and laborious, if success depended on it. It was necessary to work nights, more than twenty hours a day, and he did so. It was necessary to check out the irradiated uranium blocks personally,

and he did so, with his own hands. I tried to take an example from him. In order to see everything, I myself climbed into the pits, looked into all the cracks and holes. How else could I consider myself a good minister!

There is a lot of talk today about the government officials, calling them bureaucrats. And it is true, some of them have turned into bureaucrats. I sometimes tell my colleagues: "I, too, was such a bureaucrat, don't you know?" They refuse to believe it. I consider this high praise.

There are monumental changes taking place in the country today: perestroika, which can be called a revolution. The times are difficult, times of struggle. We need robust efforts. Discipline must be introduced. There is a lot of slack. But I am sure that, in time, we will tighten things up. Just the other day I saw on the television a demonstration of a new generation of rolling stands at a machine plant. My heart was glad. I thought, well done, lads! That is what we need: bold hands attempting large projects. And I am convinced that restructuring will give the country mighty forces to lift itself and move forward energetically.

UDC 532.7

**Kinetics of Air Oxygen Oxidation of U^{IV} in Mixed Solvents. Part 2.
Water-Dimethylformamide, Water-Caprolactam**

18410242A Leningrad *RADIOKHIMIYA* in Russian
Vol 31 No 2, Mar-Apr 89 (manuscript received
9 Jun 88) pp 23-27

[Article by Ye. A. Kanevskiy, V. B. Rengevich, and V. L. Krupnova]

[Abstract] In a previous work it was reported that the initial rate of air oxygen oxidation of UCl_4 is greater in a mixed solvent than in either water or an inaqueous solvent (dimethylsulfoxide). Thus, in a solvent containing 30 percent by volume dimethylsulfoxide, the oxidation rate reaches a maximum 50 times greater than in dimethylsulfoxide in 0.02 percent by volume water. In the present work a study was made of the air oxidation of UCl_4 in other water-inaqueous solvents. A high oxidation rate was observed in a solvent containing 30-60 percent dimethylformamide, with a maximum at 50 percent. The rapid oxidation is evidently related to the formation of complex cations containing a secondary nonaqueous component in the solvent. This hypothesis was confirmed with the oxidation kinetics in a water-caprolactam solution, where rapid oxidation was observed at 0.1 percent concentrations of caprolactam. References 8: 4 Russian, 4 Western.

UDC 546.799.3

Some Rules Governing Gas Chemical Reduction of Pu (VI) to Pu (IV) With Nitrogen Oxides in Nitric Acid Solutions

18410242B Leningrad *RADIOKHIMIYA* in Russian
Vol 31 No 2, Mar-Apr 89 (manuscript received
18 Feb 88, after revision 19 Sep 88) pp 40-47

[Article by N. V. Neumoyeva, I. A. Korotkov, T. I. Semenova, A. A. Chizhov, and E. V. Renard]

[Abstract] Dissolving irradiated fuel in nitric acid is one of the basic operations in the regeneration of spent fuel in nuclear power plants. This results in the formation of hexavalent plutonium (60-70 percent of the total concentration), which is difficult to extract. To facilitate complete extraction with neutral alkyl phosphates, the plutonium must first be converted into the tetravalent state. In the present work a study was made of the kinetics of the Pu (VI) to Pu (IV) reduction in nitric acid by continuous percolation of a mixture of nitrogen oxides (oxide and dioxide) through plutonium solutions (2-40 g/l) with a 20-95 percent initial Pu (VI) content at various acidities (3-8 mol/l nitric acid) and temperatures (50- 80°C. An empirical kinetic formula is presented for determining the rate of the process and may be used to calculate apparent rate constants for the gas chemical reduction of Pu (VI) to Pu (IV). Figures 2; references 12: 9 Russian, 3 Western.

UDC 541.14:546.791.6

Reactions of Certain Gases in Aqueous Solutions Under Effect of Photosensitized Uranyl

18410242D Leningrad *RADIOKHIMIYA* in Russian
Vol 31 No 2, Mar-Apr 89 (manuscript received
15 Jun 88) pp 53-58

[Article by S. A. Gaziyeu, L. G. Mashirov, and D. N. Suglobov]

[Abstract] The previously reported information-yielding advantages of the oxygen exchange method in studying the photochemical properties of uranyl are due to the fact that the quantum chemical yield in oxygen exchange between water and the uranyl group is very sensitive to the presence of the reduced state of the uranyl group. This method was used in the present work to study the reactions of SO₂, CO₂, H₂, CO, N₂O, NO, CH₄, and Xe in aqueous solution and stimulated with photo-excited uranyl. The latter either directly oxidizes the dissolved molecule (or its reaction product with water) or else generates a hydroxyl radical that then reacts with the dissolved molecule. The method appears to be highly effective in detecting and characterizing reactions. Reaction rate constants for the above are presented. References 22: 14 Russian, 8 Western.

UDC 542.61

Use of Dicyclohexyl-18-Crown-6 for Selective Leaching of Radioactive Strontium From Water

18410242E Leningrad *RADIOKHIMIYA* in Russian
Vol 31 No 2, Mar-Apr 89 (manuscript received
25 May 88) pp 67-71

[Article by V. V. Yakshin, B. F. Myasoyedov, O. M. Vilkova, A. M. Tuzova, A. T. Fedorova, and I. M. Rodionova]

[Abstract] Radioactive contamination of lakes and rivers is chiefly due to runoff from contaminated soil, whereas that of sea water is due to radioactive fallout from the atmosphere. The main radionuclide in fresh water is ⁹⁰Sr, and that of sea water is ¹³⁷Cs. Strontium may be successfully extracted from solution with crown esters, and most research is devoted to extraction with these compounds at pH 2.5-9 in the presence of citrate ion. Optimum reagents proved to be 18-crown-6 derivatives in solvents such as chloroform, dichloromethane, tetrachloroethane, dichloroethane, benzene, nitrobenzene, and toluene. During the extraction a Sr-crown ester-citrate complex enters the organic phase. In the present work a study was made of the effects of various factors on the extraction of strontium in the system nitric acid-dicyclohexyl-18-crown-6. Optimum conditions were found for selective leaching of strontium from mixed salt systems containing Ba, Cs, Ru, Ce, and other radionuclides. The coefficient of distribution of strontium is significantly greater than that of Cs, Ru, or Ce, and conducting the extraction under these conditions raises the coefficient of separation of these substances. A scheme for radiochemical analysis was developed and used to determine the strontium content in natural waters and salt solutions. References 17: 8 Russian, 9 Western.

UDC 546.799.7

Using Solid Extractants in Radiochemistry

18410243A Leningrad *RADIOKHIMIYA* in Russian
Vol 31 No 3, May-Jun 89 (manuscript received
3 Oct 88) pp 1-8

[Article by K. V. Barsukova, N. Yu. Kremlyankova, and B. F. Myasoyedov]

[Abstract] Selection of any particular method for separating actinide from other elements or isolating individual elements is contingent on the chemical properties of the solution being analyzed and the given problem. Normally sorption or extraction techniques are used for this purpose. Thus, extraction chromatography, which is widely used for analytical and preparatory purposes, combines both sorption and extraction by applying liquid extractants on pelletized carriers having a developed surface. A basic inadequacy of this method lies in the difficulty in preparing chromatographic columns having uniform working characteristics as well as in the

weak bond between the carrier and the extractant, which gives nonreproducible results. The present work is a review of experimental work on the utilization of solid extractants to separate, isolate, and refine transplutonium elements, uranium, plutonium, and other elements such as Zr, Hf, Th, Y, and Sr. The review covers the synthesis, properties, and applications of solid extractants. Methods for separating and isolating transplutonium and rare earth elements from complex mixtures are presented. Figures 6; references 31: 24 Russian, 7 Western.

UDC 621.039

Status of Nuclear Physics Data on Plutonium Isotopes for Analytical Purposes

18410243B Leningrad *RADIOKHIMIYA* in Russian
Vol 31 No 3, May-Jun 89 (manuscript received
13 Mar 89) pp 9-15

[Article by V. F. Kositsyn and A. Ye. Konyayev]

[Abstract] The plutonium content in various substances may be determined by various nondestructive methods based on measuring α -, γ -, x-ray, neutron, and thermal radiations. The reliability of these measurements depends in turn on both the accuracy of the method used and the accuracy of the plutonium isotope data used in making the measurements. In the present work the current status of bibliographic data on the nuclear physical properties of plutonium isotopes is reviewed from the standpoint of utilization in analytical techniques. It

is pointed out that at the present time the completeness and accuracy of data on half-life periods, spontaneous fission, neutron cross section, spectra, and the yields of α - and x-radiation, especially in the low-energy region, are evidently inadequate. References 24 (Western).

UDC 546.64+546.662+621.039.337

Cocrystallization of Microquantities of Yttrium-88 With Gd_2Cl_3 Clusters

18410243C Leningrad *RADIOKHIMIYA* in Russian
Vol 31 No 3, May-Jun 89 (manuscript received
4 Oct 88) pp 29-31

[Article by N. B. Mikheyev, A. N. Kamenskaya, and I. A. Rumer]

[Abstract] At the present time much attention is being devoted to studying condensed M_2Cl_3 lanthanide clusters having a +1.5 lanthanide oxidation state. Formation of these clusters is related to d-electrons, and the condensed clusters yield those elements of the lanthanide series that, in the bivalent state, have the electron configuration $f^n d^1$. This includes Gd and Tb. The same cluster has also been obtained with yttrium, a nonlanthanide element. In the present work a study was made of the cocrystallization of microquantities of yttrium with a Gd_2Cl_3 cluster. The possibility of forming mixed condensed clusters $[Gd(Y)]_2Cl_3$ was demonstrated, and the cocrystallization coefficient was determined to be 1.77 ± 0.09 . Possible reasons why this should exceed unity are discussed. References 9: 3 Russian, 6 Western.

UDC 539.434;697.326

Effectiveness of Magnetic Antiscale Treatment of Water

184101801 Kiev *KHIMIYA I TEKHOLOGIYA VODY* in Russian Vol 11 No 3, Mar 89 (manuscript received 8 Jan 88) pp 275-276

[Article by B. Ya. Kamenetskiy, Scientific Research Institute of Sanitary Equipment, Moscow]

[Abstract] A study is made of the effectiveness of magnetic treatment of water under conditions applicable to water-heating boilers. In an experimental heat-exchanger unit, aqueous solutions of sodium sulfate and calcium sulfate were studied because their solubility drops with a rise in temperature, a phenomenon that underlies the formation of deposits on heat exchanger surfaces. The use of a magnetic antiscale unit has no effect on Na_2SO_4 scale formation. The magnetic treatment of the water also failed to reduce scaling with CaSO_4 . In one series of experiments, the scaling actually increased, because the magnetic unit reduced the flow rate of the water. Figures 2; references 8 (Russian).

UDC 547.1'118

Phosphorylation of Azomethines by Trivalent Phosphorus Acid Cyanides

18410191B Leningrad *ZHURNAL OBSHCHEY KHIMII* in Russian Vol 59 No 3, Mar 89 (Manuscript received 27 Jun 87) pp 516-20

[Article by A. N. Pudovik, G. V. Romanov, V. N. Nazmutdinova, A. N. Chernov, and E. P. Semkina, Institute of Organic and Physical Chemistry imeni A. Ye. Arbuzov, Kazan Affiliate, USSR Academy of Sciences]

[Abstract] A study examined the phosphorylation of azomethines by P(III) cyanides, using phosphorus mono-, di-, and tricyanides. It was found that the products are the corresponding α -cyanobenzylamides of trivalent phosphorus acids. Phosphorus dicyanides and tricyanides react with imines without a catalyst; this leads to monosubstitution products. NMR spectroscopy indicated that, when phosphorus tricyanide is reacted with benzaldehyde with no catalyst, a multistage substitution of the nitrile groups occurs. Reaction of N-methyl-N-(α -cyanobenzylamido)phenylcyanophosphonite and lithium aluminum hydride in ether or THF results in the exchange of a cyano group at the phosphorus atom for a hydrogen atom. References 10: 8 Russian, 2 Western.

Specifics of Invention in Chemical Technology Within Patent Law

184102051 Kiev *KHIMICHESKAYA TEKHOLOGIYA* in Russian No 2, Mar-Apr 89 (Manuscript received 9 Mar 88) pp 106-108

[Article by V. L. Kutsevich]

[Abstract] The basic terms and principles of patent law are explained as they apply to inventions in the area of chemical technology. Techniques for minimizing commercial risk in the development and patenting of inventions in the area of chemical technology are discussed, including minimizing patenting expenses, observing the technical and legal prerequisites for maximum restriction of competitors' "field of maneuver," preventive assurance of patent purity, taking of measures to prevent disclosure of inventions and know-how, and advance search for possible licensees and consumers of inventions being considered for development. It is noted that if a patent is to be procured for purposes of monopolizing the market the patent should be sought in countries in which the local industry is not capable of producing the product; conversely, if a patent is being sought to generate license income, it should be sought in countries in which local industry could produce the product being patented.

UDC 547.755

Reaction of Hydrazine With Cyclic Ketene Acetals of Indol Series

18410212D Leningrad *ZHURNAL ORGANICHESKOY KHIMII* in Russian Vol 25 No 4, Apr 89 (Manuscript received 25 Jan 88) pp 884-85

[Article by N. K. Genkina, L. N. Kurkovskaya, and N. N. Suvorov, Moscow Institute of Chemical Technology imeni D. I. Mendeleyev]

[Abstract] Contrary to expectations, boiling 2-(3-oxo-2-indolenylidene)-1,3-dioxolan with an excess of an aqueous solution of hydrazine produces 2-(6-hydroxy-1,2-diaza-4-oxa-3-hexylidene)-3-oxo-2,3-dihydroindol with a practically quantitative yield, the product of the interaction of hydrazine with the non-cyclic carbonyl group of the ketene (present in acetal form). The reason the intramolecular reaction expected does not occur is the unfavorable placement of the groups in the molecule in that the end product is present as the Z isomer. The reason for the formation of the Z isomer alone is apparently the steric hindrance of attack of the amine reagent on the reaction center by the cyclic carbonyl group. References 5: 4 Russian, 1 Western.

UDC 547.491.4:495.1

Urethanes in Synthesis of Arylisocyanates

18410212E Leningrad ZHURNAL ORGANICHESKOY
KHIMII in Russian Vol 25 No 4, Apr 89 (Manuscript
received 5 Apr 88) pp 885-86

[Article by D. N. Rakhimov, N. P. Abdullayev, and Kh.
M. Shakhidoyatov, Institute of Chemistry of Plant Sub-
stances, Uzbek Academy of Sciences, Tashkent]

[Abstract] A phosgene-free method is developed for the synthesis of arylisocyanates from aryl urethanes and phosphorus pentachloride or phosphorus oxychloride. The reaction occurs smoothly upon heating of mixtures of urethanes and phosphorus pentachloride in a molar ratio of 1:1 at 120 to 140°C. The yield of the reaction is 60-90 percent arylisocyanates. The reaction does not occur if thionylchloride and phosphorus trichloride are present. References 4: 3 Russian, 1 Western.

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